

Coping with Power Interruptions in Tanzania:

An Industrial Perspective

A Case Study of One Small Scale Animal Food

Processing Industry in Moshi Municipality

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A thesis submitted for the partial fulfilment of the
requirement for the Master degree of Philosophy in Culture,
Environment and Sustainability

Centre for Development and Environment

UNIVERSITY OF OSLO

[Autumn, 2015]

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<http://www.duo.uio.no/>

Print: Reprosentralen, University of Oslo

Abstract

This study explores the perceptions of electricity users and supplier (Tanzania Electricity Supply Company (TANESCO) in Moshi- Tanzania .It also examine coping strategies of power interruptions in a small scale industry under the study. The specific objectives of the study are (1) to explore perceptions of staff in the industry and among TANESCO towards interruptions in power supply (2) to describe the coping strategies developed by the industry under study. This study was guided by Resource Dependence Theory (RDT) by Pfeffer and Salancik (1978).

The study employed qualitative methods and techniques include interviews, observations and document review. The findings show that there was a difference in perceptions and explanations of power interruptions among the interviewees from the industry and TANESCO. On the one hand, the industry interviewees attributed the power interruptions to government faults and little efforts to curb the situation, unimplemented energy policies, dependency of hydropower, monopoly of TANESCO, corruption and high demand than supply. On the other hand, TANESCO staff directed their attention on power interruptions to maintenance issues, lack of capital to improve infrastructures, thieving and voltage fluctuation

The coping strategies for power interruptions in the industry included the use of part time and untrained workers, staff working overnight and during weekends, change of mixing machine to the big and modern one and bribing technicians from TANESCO. Internal and external coping strategies used by the industry ties with the RDT framework which guides this study. The industry modifies its internal structures and sometimes alter external environment to cope with power interruptions.

The study confirms that there is a need of increasing generation capacity, improve infrastructures and use of alternative electricity sources in Moshi and Tanzania, this is because there is high demand of electricity than amount supplied.

Acknowledgement

Many people helped me in different ways through various stages of this research work. Although it is impossible to mention them all by names, I feel obliged to single out some of them.

My first thanks go to my sponsor, the Norwegian Government for offering me the scholarship under Quota programme, without which I could not undertake this programme. My second gratitude and many thanks go to my supervisor Tanja Winther who has a special place in this great achievement. I really appreciate her constructive comments and guidance which helped me to finish this task of writing. Next, I would like to thank the faculty of Humanities, specifically the Centre for Development and Environment (SUM) which enabled me to attend the courses. In the same line I would like to thank TANESCO Regional Office Moshi and the industry under the study for their positive participation and contributions which helped me to collect data during field work in Tanzania.

My special thanks should go to my parents, Mr. and Mrs. Ephrem Kavishe, as they were ready to miss my company at the time of my study. They gave me moral, mutual support and take care of my son. In a very special way my thanks goes to my beloved sister Grace Hans for taking care of my son Nickson, I left him with her while he was only 37 days old.

I would not forget my brothers and sister (Valentine, Gilbert and Angela) for their support. Moreover, my special thanks should also go to Jane Barongo for her special help in this work, my uncles and other relatives for their moral and material supports. I thank them all by saying “Iruwa awaininge mbora”.

Theodora Kavishe.

List of Abbreviations

ADB	Africa Development Bank
CTI	Confederation of Tanzania Industries
D1	Domestic Low Usage Tariff
DAS	District Administrative Secretary
DARESCO	Dar es Salaam and District Electric Supply Company
EAPP	East Africa Power Pool
EPP	Emergency Power Producers
ESRF	Economic and Social Research Foundation
GDP	Gross Domestic Product
GWh/Day	Gigawatt hour per Day
IPTL	Independent Power Tanzania Limited
IPPs	Independent Power Producers
ITV	Independent Television
JAICA	Japan International Cooperation Agency
kWh	kilowatt-hour
KVA	kilovolt-ampere
Kv	Kilovolt
MEM	Ministry of Energy and Minerals
MUCOBS	Moshi University College of Cooperative, and Business Studies
MW	Megawatt
MVA	Mega Volt Ampere
NBS	National Bureau of Statistics
PAP	Pan Africa Power Solution
PSMP	Power System Master Plan
REA	Rural Electrification Agency

RDT	Resource Dependence Theory
SAPP	Southern Africa Power Pool
SIDO	Small Industries Development Organization
Sq mi	square mile
T1	General Usage Tariff
T2	Low Voltage Usage Tariff
T3	High Voltage Usage Tariff
TANESCO	Tanzania Electricity Supply Company
TBC	Tanzania Broadcasting Corporation
TZS	Tanzanian Shillings
URT	United Republic of Tanzania
USAID	United States Agency of International Development
ZECO	Zanzibar Electricity Corporation

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1 Introduction

This chapter presents the background, statement of the problem and motivation for the study. It continues with objectives, research questions, approach, scope and structure of the dissertation.

In this study words such as “power and electricity” are used interchangeably to mean the same.

Again the term “the industry” is used to refer to a specific case study used in my study because I choose the study to be anonymous. TANESCO is not the main focus of the study but I wanted to understand their perceptions towards electricity interruptions because they are the electricity producer and supplier. TANESCO has been involved because it is the source of electricity in which the industry depends on for production. Therefore my study will examine the perceptions of both and focus only on the coping strategies employed by the industry as my research title states.

Again, the word “environment” or “external environment” in the study is used to mean the resource which is electricity from outside the industry and the only source of power for production.

Further the word “perception” in the study means how do the respondents view or associate electricity interruptions with.

Lastly, the word “electricity supplier/producer” and “TANESCO” are used interchangeably to mean the same.

1.1 The Background to the Problem

Power interruption is a common problem facing many developing countries in the world and Tanzania in particular. Many studies have revealed that a power interruption is a major problem affecting production in firms in sub Saharan Africa and developing countries. Power interruption is attributed to low generation capacity, poor

infrastructures and much dependency on hydro as the main source of electricity (Alam, 2013; Moyo, 2013 and Trulsson, 1997).

There is vast literature showing how small industries are grappling to cope with power interruptions in developing countries, especially Tanzania. Many researchers like (Alam, 2013; Reinikka and Svensson, 2002; Fisher-Vanden et al, 2012 and Salm et al, 2011) have observed the crisis of power interruptions in developing countries and explained how firms are coping with the situation.

Most of the literature about power interruption has focused on the causes, effects of power interruption, and costs firms need to incur to get alternative power supply as a result of unreliable electricity supply from national grids (Nooij et al, 2006; Cissokho and Seck, 2013 and Licsko et al, 1993). Other studies on power interruption investigated on the costs of using alternative power sources in small industries (Ilskog, 2011; Moyo, 2013; Fernandes, 2006 and Hussain et al, 2012).

While there is extensive research focussing on power interruptions around the world, very few have captured the depth of the crisis of power interruptions among small industries in Tanzania. Very few studies have attempted to examine the experience of small industries in coping with power interruptions. In light of this, this study seeks to examine the perceptions of electricity users in small scale industry and those of TANESCO. Again this study will describe coping strategies used by the industry.

1.1.1 Statement of the Problem

Ministry of Energy and Minerals (2012) reported that electricity was first introduced in Tanzania (then Tanganyika) in 1908 by colonial authority. In 1931 two electric companies were established, namely; the Dar es Salaam and District Electric Supply Company (DARESCO) and the Tanganyika Electric Supply Company (TANESCO). Furthermore in the time of independence (1961) the government acquired shares in both utility companies and in 1975 the government acquired all shares and created one state owned utility called TANESCO (MEM, 2012).

Developing countries including Tanzania continue to face the problem of power interruptions and shortage (TANESCO, 2014). Some studies have investigated the effects of power interruptions and how industries in developing countries are coping with challenges (Alam, 2013; Reinikka and Svensson, 2002; Fisher-Vanden et al, 2012 and Salm et al, 2011).

Many studies have been conducted over the effects of power interruption and coping strategies used in the industries in developing countries (Alam, 2013; Reinikka and Svensson, 2002; Fisher-Vanden et al, 2012 and Salm et al, 2011). Other studies have investigated the costs of power interruption worldwide (La Commare and Eto, 2006; Moyo, 2013; Sullivan, Terry and Mark, 1997 and Fernandes 2006)

Despite extensive research on the subject of power shortages and interruptions in many parts of the world, there has been little focus on the perceptions of electricity users in industrial sector in Tanzania and Moshi in particular. To bridge the research gap, this study explored the perceptions of electricity users in a small industry in Moshi and those of electricity supplier (TANESCO) and coping strategies developed by the industry.

1.1.2 The Motivation for the Study

The motivation for conducting this study partly grew out of my own concern about power interruption in Tanzania. After observing the plight of small industries in Tanzania regarding electricity supply, I picked interest to conduct this project. From around 2011 to 2013 there were serious power interruptions all over the country.

By 2012, the situation had worsened where there was power rationing of about 3 -5 days a week. Power interruptions went on for approximately 12 hours of a day. The government and TANESCO had announced that there would be no electricity in the whole country following a 2011 drought. It should be noted that most of Tanzania's electricity is generated from hydropower; therefore drought largely affects generation of electricity in Tanzania TANESCO. The above concerns motivated me to conduct a study on how small industries in Tanzania are coping with power interruptions.

I was particularly interested in understanding the perceptions of electricity users from the small industry, (how do the staff from the industry and TANESCO perceived power interruptions).

In addition, I wanted to investigate what strategies these small industries use to cope up with power interruptions. I gained interest in this study because of my personal experience having been brought up in Moshi, an area with frequent power interruptions. This interest led me to ask the following questions; amidst rampant power interruptions how does the industry manage to survive with no power and no alternative sources?

1.1.3 Objective of the study

The objective of this study was to investigate the perceptions of electricity users and supplier regarding electricity interruptions in Moshi. Additionally, to find out the strategies the industry has used to cope with such challenges.

1.1.4 Specific Objectives

1. To explore perceptions of staff in the industry and among TANESCO towards interruptions in power supply
2. To describe the coping strategies adopted by the industry under study.

1.1.5 Research Questions, Approach and Scope of the Study

This study was guided by the following research questions:

1. What are the perceptions of electricity users in the industry and TANESCO towards interruptions in power supply?
2. What are the coping strategies adopted by the industry?

Approach of the Study

This study employed qualitative approach and techniques used include interviews, observation and document review were techniques used. Resource Dependence Theory by Pfeffer and Salancik 1978 guided the study. Authors of RDT developed four themes. This study was guided by two among four themes which are (a) the organization can adopt and change to fit environmental requirements and (b) the organization can attempt to alter the environment so that it fits the organization's capabilities. The reasons of using the two themes are because they are relevant to my study. The chosen themes also clearly explain how the industry adjusts itself internally and externally so as to cope with electricity interruptions.

Significance of the Study

As pointed out above, there is limited research on how small industries in Tanzania are coping with electricity interruptions; this study seeks to contribute knowledge on how small industries in Tanzania are coping with electricity interruptions.

Furthermore, it is hoped that the study will provide useful information to TANESCO and Tanzania Ministry of Energy and Minerals (MEM) on the perceptions of electricity users from small industries on electricity interruptions. The perceptions may help the government to see where the major challenge is and improve the situation. It should be noted that industries are the largest consumers of electricity in Tanzania therefor they should be considered (TANESCO, 2013).

Moreover the government can use the information from this study and allocate resources to improve generation, transmission and supply of electricity to the country and to the industries in particular. This is because in Tanzania we still have many small and medium scale industries with no alternative electricity supply thus depends mainly on electricity for production.

Further, it is hoped that results of this study would offer positive recommendations to government to allow more competition and privatization in electricity generation, transmission and distribution. As pointed out in chapter two, TANESCO is the main

producer and supplier of electricity in Tanzania which leads them to relax because to no competition in service provision. Therefore in improving the electricity service to the customers, the government can engage more companies in electricity sector.

Therefore the focus of the study seeks to bridge the scholarly gap concerning perceptions of electricity producers and users with coping strategies adopted by the industry to deal with the challenges of electricity interruptions.

Scope of the Study

This study was limited to one small scale animal food processing industry. The selection of the industry was based on the industry's dependence on electricity as the only source of power for their animal food production. I visited the industry on occasions when there was no electricity as well as when electricity was available. On these visits, I observed how the people were working on the days when there was power. On days without power, in most cases, the workers (only those in production) would rest or engage in first stages of preparations of food which does not use electricity if the interruption was for a short period of time. If the interruption was for more than six hours, then they would knock off. The main focus of these visits was to explore the perceptions of staff and the coping strategies employed in the industry. This study specifically intended to answer the question, what happened during days with electricity interruptions, regarding how production is conducted?

The study was confined in Moshi in Tanzania where there are frequent interruptions in electricity. According to (TANESCO, 2014) Moshi has higher electricity access compared to other regions with exclusion of Dar es Salam but still Moshi is faced with electricity interruptions.

In Tanzania apart from low generation capacity where the country's demand is 934.62MW versus available electricity which is 771.79MW (MEM, 2014), electricity supply is faced with poor infrastructure, that is old pylons, cables, transformer which easily blows and the other challenges include technical and non-technical, the company face the problem of having few expertise and lack of communication which delay service provision. For instance when there is breakdown in the electricity system like

transformer blow it can take up to a week for TANESCO to fix. This is non-technical problem rather a problem of fund but it contributes to electricity interruption.

The table below presents the amount of electricity received and distributed in Moshi for the last three years. It can be seen that there is electricity loss and it was explained by the interviewee that poor and worn out infrastructure being among the causes for the electricity loss. For example in the year 2013 electricity received in Kiyungi substation was 183,843,870kW, the distributed electricity amount was 155,649,412Kw and lost 28,194, 458Kw were lost during transmission.

Table 1 Electricity Received and Distributed in Kilimanjaro 2011-2013

	Received kW	Distributed kW	Electricity Lost kW
2011	164,680,743	136,262,929	28,417,814
2012	180,306,169	153,896,312	26,409,857
2013	183,843,870	155,649,412	28,194, 458

Source: TANESCO Regional Office Moshi

1.1.6 The Structure of the Dissertation

The thesis is divided into eight chapters. The first chapter is the introduction; this is followed by, chapter two which presents the electricity interruptions, administration of energy in Tanzania. It also presents an overview of Moshi Municipality. This chapter ends with the causes of electricity interruptions. Chapter three presents theoretical framework. In this part, the Resource Dependence Theory (RDT) and the conceptual framework are presented; this is concluded with a discussion of the relevance of RDT to the study.

Chapter four presents literature review on electricity interruptions worldwide. The chapter ends with a synthesis of the related studies. The research methods used in this

study are presented in chapter five. This includes approach to the study, the justification of using qualitative method, the case study research design, and sample and data collection techniques. It also explains reliability, validity and ethical consideration.

Chapter six presents and analyses the findings. The finding are organized and presented in two main themes in response to the two research questions of the study. Chapter seven discusses the study's findings in relation to Resource Dependence Theory and the literature. The last chapter summarizes and concludes the study and provides some recommendations for action and for further studies.

2 Electricity Interruptions in Tanzania

Chapter two presents electricity interruption situation in Tanzania. It starts with country profile, administration of energy sector and narrows down to Moshi Municipality. Energy and electricity sources together with causes of power interruptions are presented in the last part.

2.1 Tanzania- General Context

The United Republic of Tanzania (URT) was formed from the union of Tanganyika and the island of Zanzibar. Tanganyika gained its independence in December 9, 1961 while Zanzibar got independence in December 10, 1963. In April 26th 1964 a revolution took place, after which the United Republic of Tanzania was born. Tanganyika is today referred to as Tanzania and Zanzibar is still referred to as Zanzibar. The United Republic of Tanzania is made up of 25 regions in the mainland and 5 regions in Zanzibar with the population of 44,928,923 of which 43,625,354 is on Tanzania Mainland and 1,303,569 is in Tanzania Zanzibar (National Bureau of Statistics, 2014)

The United Republic of Tanzania lies south of the equator. Tanzania is located on the eastern side of the African continent. The country is situated on the East African seaboard between longitudes 29⁰ and 41⁰ East and latitudes 1° and 12° south. Tanzania has a total of eight bordering countries as it is shown in Figure 1.0 below. To the North are the Republics of Kenya and Uganda, to the West Rwanda, Burundi and the Democratic Republic of Congo and to the South, Zambia, Malawi and Mozambique. Tanzania has a total area of 945,200sq with a coastline covering 1,424km. It has a tropical type of climate (Bureau of statistic, 2013).

Figure 1 Map of Tanzania



Source: <http://www.lib.utexas.edu/maps/tanzania.html>

Tanzania is a multi-party political system with 20 registered political parties. Since the establishment of multi-party democracy in 1992, Tanzania has demonstrated steady progress in democratization and respect for human rights. The fourth multi-party elections held in October, 2010 brought in His Excellency Jakaya Mrisho Kikwete from Chama Cha Mapinduzi (CCM) as the fourth President of the United Republic of Tanzania for the second and last term. It is by law that in Tanzania the president is allowed to be in the office for only ten years which is two terms of five years each. The official currency is Tanzanian Shilling (TZS) and the national language is Kiswahili. Together English and Kiswahili are official languages used in all formal business (USAID, 2014).

The economy of Tanzania is still highly dependent on agriculture which contributes to an estimated 30 percent to Gross Domestic Product (GDP). The agricultural sector is employing nearly 80 percent of the working population where the majorities are living in rural areas. Again there is the service sector which has been growing rapidly in recent years in Tanzania and accounts for approximately 47 percent of the employment within the country (ADB-OREA, 2011). The agriculture and service sectors are expected to continue their dominance of the economy in the predictable future. The industrial sector dominated by the construction subsector, accounts for 23 percent.

Industrial production dropped in 2008-09 as the result of the global economic slowdown. However, the industrial sector has now recovered, despite severe and persistent power outage together with rising of fuel prices, both of which do not promise well in industrial development for the short and medium terms.

On the other hand the economy of Tanzania has contribution from mining sector. Since 2000, the mining subsector has attracted the majority of Foreign Direct Investment (FDI), contributing to its rapid growth. Nevertheless, mining sector share of GDP remains small (2.3 percent), partly because is not linked to the other sectors of the economy (ADB-OREA, 2011).

2.2 Administration of Energy Sector in Tanzania

Ministry of Energy and Mineral (MEM)

The administration of energy sector in Tanzania is under the Ministry of Energy and Minerals (MEM) in main land and Ministry of Water, Construction, Energy and Lands is responsible for all energy related matter in Zanzibar. The MEM is responsible for preparing plans for the energy sector in the country. The government through MEM formulates energy policies which govern energy generation, transmission and distribution in the country. At present, the electricity sector's act provides separate licenses for generation, transmission and distribution. ZECO in Zanzibar is a utility energy company responsible for electricity distribution (MEM, 2012).

Energy and Water Utility Regulatory Authority (EWURA)

Since Tanzania's independent in 1961, the government nationalized Electricity Company to improve access of power to the customers. In 2006, the government established a body called Energy and Water Utility Regulatory Authority (EWURA). EWURA is the regulatory authority responsible for electricity, gas pipeline transmission and distribution, water and sewerage system. EWURA was granted most of regulatory tasks such as licensing, standards, tariff regulation, performance, and monitoring and enforcement compliance with law standards. EWURA regulates the energy prices in accordance to world market (MEM, 2013).

Rural Electrification Agency (REA)

In 2007, the government embarked on rural electrification programmes. REA is a state agency under MEM responsible for rural electrification and development of rural projects. REA owned Rural Energy Fund (REF) which is used to promote and finance renewable energy projects in rural areas under taken by the small Independent Power Producers (IPPs). In improving the rural energy services, the government formed REA. The body is responsible for boosting modern energy services in rural areas. In recent years there has been improvement of electricity access by 2% in rural areas of the country as the result of accomplishment of some REA projects in regions of Kilimanjaro, Tanga, Shinyanga and Kigoma (ESRF, 2009).

Tanzania Petroleum Development Corporation (TPDC)

Tanzania Petroleum Development Corporation (TPDC) is a parastatal organization under MEM. TPDC is responsible for promoting exploration activities on oil and natural gas. According to (ESRF, 2009) functions of this corporation includes; to promote the development of the petroleum industry and the production of petroleum, carry on the businesses of prospectors, producers, refiners, stores, suppliers and distributors of petroleum. Another function is to conduct or engage in petroleum prospecting operations including exploration, drilling, testing, appraisal, extraction, producing, treatment, storing, transportation and such other activities such as undertaking project associated with the exploration and mining.

Tanzania Electric Supply Company Limited (TANESCO)

TANESCO is a parastatal organization under the MEM established at 1964. The company is one hundred percent owned by the Tanzanian government. The company generates, transmits, distributes and sells electricity to Tanzania Mainland and sells bulk power to the Zanzibar Electricity Corporation (ZECO). TANESCO owns most of the electricity generating, transmitting and distributing facilities in Tanzania Mainland (TANESCO, 2013).

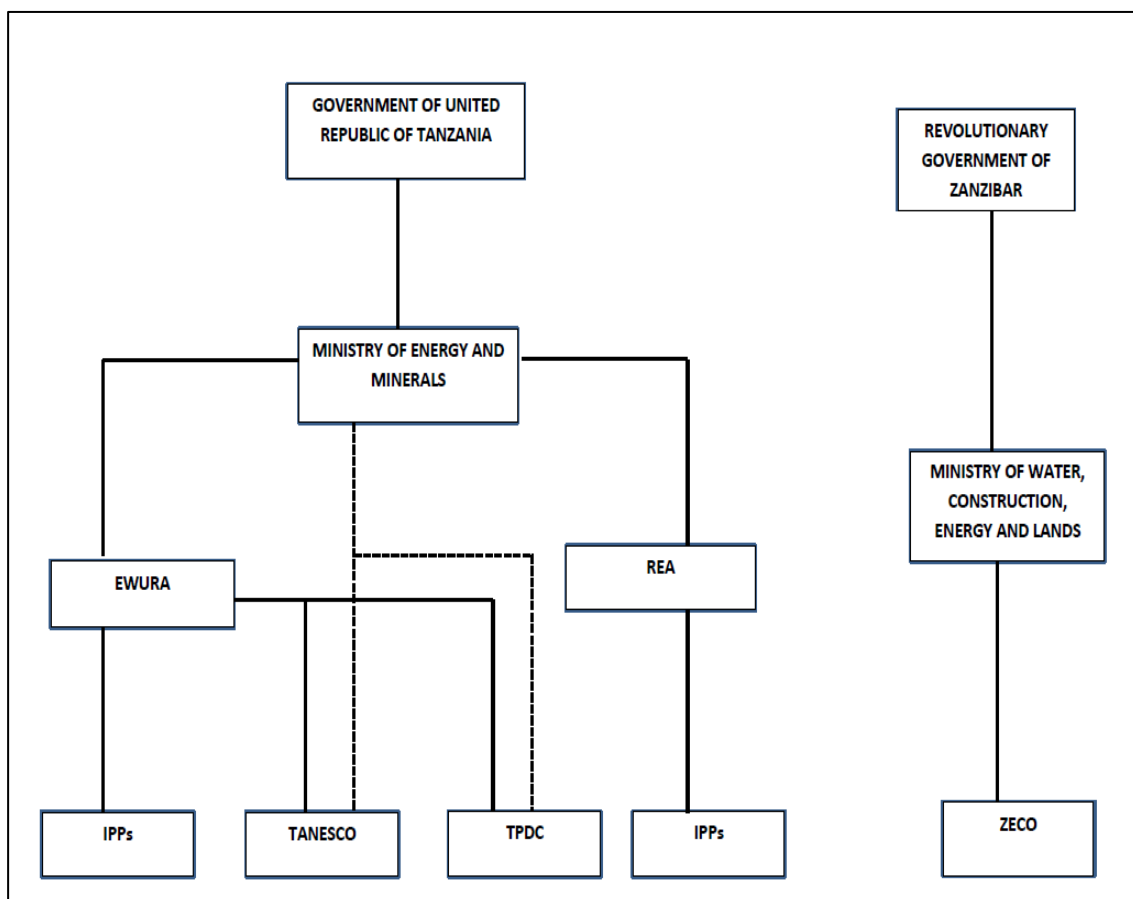
The main functions of TANESCO is to generate electricity mainly from hydropower plants and thermal power plants, transmits electricity from the generating sources to the stations and substations. Finally TANESCO distributes electricity directly to the customers. In Tanzania TANESCO is the only electricity company responsible for distribution of electricity all over the country. The company also conducts research all over the country for future development plans in electricity generation to meet the country's requirements. The country's power generation system includes the hydro, thermal and gas power with hydropower contributing about 90% of the total electricity generation (MEM, 2012).

The transmission system owned by TANESCO comprises about: 220 kV -18 lines (2,732 km) 132 kV -16 lines (1,543 km) 66 kV -5 lines (544 km). Also TANESCO manage 38 grid primary substations of 2,189MVA while the installed power capacity in Tanzania is 1,509.85MW. However TANESCO imports power from Uganda via 132 kV, (8MW) and Zambia through 66 kV, (5MW) .The unconstrained peak demand is 950 –1,000MW to meet country electricity demand(MEM ,2012). In addition the growth in power demand is 10%-15% per year and due to recent recurring droughts of (2010, 2011and 2012) peak demand is suppressed to 851.35MW in October 2012. The annual energy consumption for the country is 5,740.84GWh (MEM, 2012).

Moreover the highest energy demand stands at 16.9 GWh/Day. Only 14% of the country is electrified (12% of urban and 2% of rural). Access to electricity is about 18.4%. The Current total number of customers is 1,032,000 and maximum number of connections per year achieved is 90,000 (MEM, 2013).

However in Tanzania four different price levels of electricity exist. Domestic Low Usage Tariff (DI): 230V supply with consumption less than 50 kWh per month, is subsidized and includes services, General Usage Tariff (T1): 230V or 400V supply with consumption above 283kWh , Low Voltage Usage Tariff (T2): 400V supply with consumption above 7,500 kWh, but less than 500 KVA and High Voltage Usage Tariff (T3): consumers using 11kV and above. The average tariff is 12.6USc/kWh (TANESCO, 2013). Administration of the Energy Sector in Tanzania is summarized by the figure 1.0 below:

Figure 2 Administrative Structure of the Energy Sector in Tanzania



Source: MEM, 2012

2.3 Moshi Municipality

The food processing industry under study is located in Moshi Municipality, the headquarters of Kilimanjaro region. Moshi municipal is located at the lower slopes of Mount Kilimanjaro, a volcanic mountain which is the highest in Africa. This municipal has a population of 184 292 (Bureau of statistics, 2012) and is a home of Chagga, Pare and Masai tribes. The municipality covers about 59 square kilometres and is the smallest municipality in Tanzania by area. It lies on the A23 Arusha–Himo east–west road connecting Arusha Tanzania and Voi, Kenya. Just to the east of Moshi is the intersection with the B1 north–south road connecting with Tanga and Dar es Salaam. Moshi is often considered as the most environmentally clean municipal in Tanzania (MUCOBS, 2008).

The economy of the Moshi municipal mainly depends on agricultural and tourism activities. The presence of Mount Kilimanjaro has made Moshi municipal a tourist town. There are several big and small industries located in Moshi. Manufacturing industries include TPC Ltd (which deals with sugar production), Bonite Bottlers Ltd (soft drinks), Serengeti Breweries Ltd, Tanzania Breweries (for beers), Kibo Match Group Inc (producing match box), African Mosfly Industries Ltd, Union Service Stores, and Imara Wood Productions Company Ltd which deals with production of furniture (National Bureau of Statistics, 2013).

Food processing industries located in Moshi include HARSHO Company Ltd, Moshi Animal Feeds (production of animal foods) Akidya (T) Ltd, Tanzania Coffee Board, and Kahawa House Marenga Inv.Co. Ltd and Coffee Curing Milcafe Ltd (curing, grinding, and packing of coffee) .Further, there are metal working workshops in Moshi municipal such as Simon Engineering, Press Forge and CFW .In addition, Moshi is a host to a number of agro-industry activities that includes greenhouse farms for flowers and vegetables like Rose Kombe Company (MUCOBS,2008).

However most of these industries depend of electricity from TANESCO which faces frequent electricity interruptions. Regardless of Moshi being with high electricity access compared to other regions of Tanzania, There are still frequent electricity interruptions.

According to (TANESCO, 2014) electricity access in Moshi municipal is expected to reach 87% by end of 2015 after completion of two projects current undertaken by The Japan International Cooperation Agency (JAICA) and Rural Electrification Agency (REA) in collaboration of government .

Figure 3 Map of Moshi Municipal

The area in the map with red colour is where the industry under my study is located.



Source: <https://www.google.no/search?q=map+of+moshi+tanzania&biw>

Energy and Electricity Sources in Tanzania

Tanzania is supplied with different energy sources most of which are untapped, these include biomass, hydro, uranium, natural gas, coal, geothermal, solar and wind. The primary energy supply includes biomass (90%); petroleum products (8%); electricity (1.5%), and the remaining (0.5%) is contributed by coal and other renewable energy sources (Msyani, 2013). More than 80% of energy delivered from biomass is consumed in rural areas. In the country side biomass is the main energy source for house hold activities like cooking. The use of biomass contributes to deforestation, while the

importation of oil costs about 25% to 35% of the nation's foreign currency earnings. To-date only about 18.4% of the country's population has gained access to electricity (Msyani, 2013).

2.4 Causes of Electricity Interruptions in Tanzania

Tanzania like many other developing countries in the world is suffering from electricity interruptions. Electricity in the country is characterized by frequent interruptions, and thus small business like the industry under this study and electricity users at household level who have no alternative power sources are affected. Some of the major causes of electricity interruptions in Tanzania are discussed.

Poor and worn out Infrastructure

Poor and worn out electricity infrastructure in Tanzania contributes to electricity interruptions. According to (TANESCO, 2012) poor infrastructure is a major contributing factor to electricity interruptions in Tanzania. Moreover, electricity transmission and distribution lines are very old. Due to poor and old electricity infrastructure there are frequent electricity interruptions. The breakdown includes fall of electricity poles and electric cables, failure of the transmission cables to carry enough load and hence electricity system fail to operate effectively. These technical and non-technical breakdowns leads to power interruption within the country.

In addition (CIT, 2011) argues that poor and worn out infrastructures is a major challenge facing electricity supply in Tanzania. According to CTI report, the major challenge facing power supply in Tanzania is devastating infrastructure both for generation, transmission and distribution. Poor infrastructures contributes to either low productivity or technical and non-technical losses of electricity. Generally, electricity systems all over Tanzania is very old, Electricity interruptions is thus mainly attributed to poor and old infrastructures. Moreover, the growing number of electricity consumers customers in the country have to depend on the same electricity system built since 1960's.

Electricity Theft

Another contributing factor for electricity interruptions in Tanzania is theft of electricity equipment which continues to pose serious problem in Tanzania's energy sector. According to (Degani, 2013) theft of electricity is major contributing factor of electricity interruptions. There is a bad tendency of customers to use part time TANESCO technician known as (vishoka) to connect electricity illegally. These illegal connections may cause overload and even insufficient supply as supply becomes smaller than the demand. These practices often lead to huge revenue loss to TANESCO which affects effective delivery of electricity. When there is less revenue, services become worse and customers experience more interruptions in power supply.

According to (Lyimo, 2006), some of the challenges facing TANESCO in its operation include theft of electricity and electricity equipments done by unfaithful TANESCO workers and unfaith people. These workers receive bribes from unfaithful electricity customers and give false meter readings and make illegal connections. There is tendency of some people to steal the electricity cable, transformer's fuel among others. These practices lead to breakdown and improper functioning in the electricity system and result into power interruptions.

Demand versus Supply of Electricity

In Tanzania demand for electricity is higher than supply, this has largely contributed to interruptions of electricity supply. TANESCO depends on much of its electricity from hydropower as a major source. In case of insufficient water, there is low production which results into low supply of electricity. A report by (CTI 2011) discussed dependency of electricity production only from hydro is a major challenge in the country. Electricity demand is growing fast because of population growth and economic activities which mainly involve electricity in the operations. It was argued that in Tanzania there is a gap between demand and supply of electricity.

Monopoly of TANESCO in Electricity Sector

Monopoly by TANESCO in generation, transmission and supply of electricity in Tanzania is a major problem. According to (CTI, 2011) Tanzania's power sector is dominated by a single company TANESCO, under the Ministry of Energy and Minerals whose main function is generation, transmission, and distribution of electricity in the country. The company is therefore responsible for all power generation although there are other small sources of generation from Independent Power Producers (IPPs) which feed the national grid and isolated areas (CTI, 2011:9). Being the major provider of electricity has arguably led to inefficient supply of electricity, mainly due to lack of competition from other companies.

Voltage Fluctuation

Voltage fluctuation has been cited as one of the causes of interruptions in electricity supply in Tanzania (Salm et al, 2011). The authors argued that power cuts in Tanzania are due to voltage fluctuation. During transmission of electricity, if the voltage goes very high there is a possibility of automatic switching off of electricity in the system to avoid damages of machines. While if the electricity voltage goes very low there is insufficient load carried within the electricity system and hence failure in supply of electricity.

Since 2006, the government of Tanzania has made several efforts to eliminate power interruptions but this has there has been little success. Several projects have been carried out to rectify the problem of power supply in the country; yet the power problem has been intensifying and the rationing of electricity continues to take place throughout the country (CTI, 2011).

All the possible causes of electricity interruptions in Tanzania are recognized by the government. The government through TANESCO and MEM is working hard to reduce interruptions in electricity supply. This is done using different strategies including introducing several electricity projects like Rural Energy Agency (REA), which is mainly based in rural areas where the situation is worse. The government is also making efforts to increase installation capacities; introduce new power plants, contracting some

electricity producing companies like Emergency Power Producers (EPP), Independent Power Producer (IPP) and aggreco in trying to eliminate power interruption (MEM 2012). In dealing with power interruption, MEM has prepared a Power System Master Plan (PSMP) which if well implemented, would reduce power interruption and shortage. The plan is proposing alternative power supply like gas, coal, biomass, geothermal, solar, wind and uranium which have not been optimally utilized, which is also environmentally friendly (MEM, 2012).

Tanzania's failure to reduce electricity interruptions includes corruption in tendering of the electricity projects which has led to huge financial losses to the government. Corruption within TANESCO has been discussed by (Degani, 2013) in his study in Dar es Salaam Tanzania. The study explained engagement of corruption in signing of different contracts between TANESCO and some companies like Independent Power Tanzania Limited (IPTL), Net group solution and Songas. Therefore because of corruption involved it was argued that IPTL and Net group solution underperformed and TANESCO had no power to sue them. So the projects were not completed and electricity interruption is still a major problem in Tanzania.

A good example is IPTL which has been reported to spend up to US \$ 13 per month in its operations and yet they have failed to contain the crisis of power interruptions in Tanzania (Degani, 2013). The government of Tanzania is aware of corruption tendencies in electricity sector and takes serious measures to those who are involved. For instance in 2014 there was a big corruption scandal of 324 billion TZS associated with contracting Pan Africa Power Solutions Tanzania Limited (PAP) and VIP Engineering companies in electricity production. Top government officials like Minister of MEM and Attorney General resigned, secretary of MEM, Minister of Land, Housing and Human Settlement and Development were fired in December 2014. Many other government officials and business people who were involved are in court.

3 Theoretical Framework

This chapter presents the theoretical framework used in the study. The chapter is divided into two parts. Part one focuses on the Resource Dependence Theory (RDT) and the second part discusses conceptual framework and the relevance of theory.

3.1 Resource Dependence Theory (RDT)

Resource Dependence Theory (RDT) was developed by Pfeffer and Salancik (1978). This theory looks at how dependence of external resources by the organizations affects the behaviour of the organization. In this theory, external resource means all the resources an organisation depends on which are from outside the organisation. This may include all the raw materials, power and labour. In this study, external resource means electricity which is from outside the industry.

RDT explains changes in the organization's action, behaviour and structure in accordance with the external environmental resource they depend on to survive. It can be seen in this theory that organisation can change its actions, working behaviour to be in line with the availability of the external resources. In this study the external resource in which the organization depends on for its survival is electricity. This study focuses on an industry (organization) and electricity (external resource). The industry has no alternative source of electricity like generator or off grid electricity that can be used for production. It is dependent on electricity supplied from TANESCO which faces frequent interruptions. Therefore it is important for the industry to change some of its structures and actions in order to cope with electricity interruptions; this is discussed in detail in chapter seven. Pfeffer and Salancik who are the early founders of the theory provide three basis of RDT as follows;

- The survival of an organization rests on its ability to acquire and maintain resources.
- No organization has full control of all its resources, some need to be sourced from the external environment.

- Hence, organizations are to a certain degree, reliant on their environments to survive.

In the RDT dependence on external resources is not a problem, however because of the lack of reliability of those external resources, therefore the organization need to make necessary changes to cope with the lack of reliability

In my case, electricity supply is unreliable and the industry is experiencing electricity interruptions. Acquiring certain resources can therefore be problematic and any organisation would prefer to operate in an environment without constraints. Environmental changes, new organisations constantly emerge and existing ones leave, reduce the scale or merge. As the founders of RDT stated that no organisation is in full control of all the resources, organisations are reliant on the environment. If the environment the organizations depend on is unreliable, some of them may close down, merge or reduce the scale so as to limit the need for external resources.

In order for the organisations to perform effectively with reduction of dependence on the external environment, Pfeffer and Salancik develop four themes as guidance. Organisations can reduce dependence by;

- a) Endeavour to increase their power over and hence reduce their dependency on critical resources.
- b) Organizations can reduce dependency by either acquiring as much control over critical resources as possible or acquiring control over resources that make other organisations reliant on them.
- c) The organization can adopt and change to fit environmental requirements.
- d) The organization can attempt to alter the environment so that it fits the organization's capabilities

In RDT it is stated that “organizations are certainly bound up with the conditions of their environment” (Pfeffer and Salancik 1978:1). It has been argued that environment and organizational environments are important for understanding actions and structures of any organization. Organizational survival and effectiveness is determined by its environment. In my case, survival of the industry is determined by the availability of electricity because there is no any other source of electricity for production.

The key to organizational survival is its ability to acquire and maintain resources and no organization which is completely self-contained. Thus organizational effectiveness comes when it adjusts to, and copes with its environments. The industry in this study adjusted internally and externally in order to cope with electricity interruptions.

According to (Hirsh, 1975), reducing dependence, organizational management has an important role to play in making decisions. Obtaining of external resources is an important principle of both the strategic and planned management of any company. In order for the organisation which depends on external resources to survive, management is involved in planning how to obtain the resources. The management is an important organ which should arrange organisations actions and structures in accordance to availability of the external resources.

In this study, management had an important role to play on how to run production regardless of electricity interruptions within the industry. The management of the industry developed coping strategies which were adopted by the industry to cope with electricity interruptions. Further, (Hirsh, 1975) recognizes the influence of external factors on organizational behaviour and, although controlled by their context, managers can act to reduce environmental uncertainty and dependence.

In his study using RDT (Hirsh, 1975) compared the pharmaceutical and music industries, which both rely on patent law to survive. The study indicated that the pharmaceutical industry was more profitable as it was better equipped to modify its legal environment to its own advantage. The pharmaceutical industry adjusted its external environment by lobbying so as to get support in running the industry. Therefore an organization can either alter or try to influence its external environments to survive.

Out of the above four themes developed in the RDT, this study will focus only on these two;

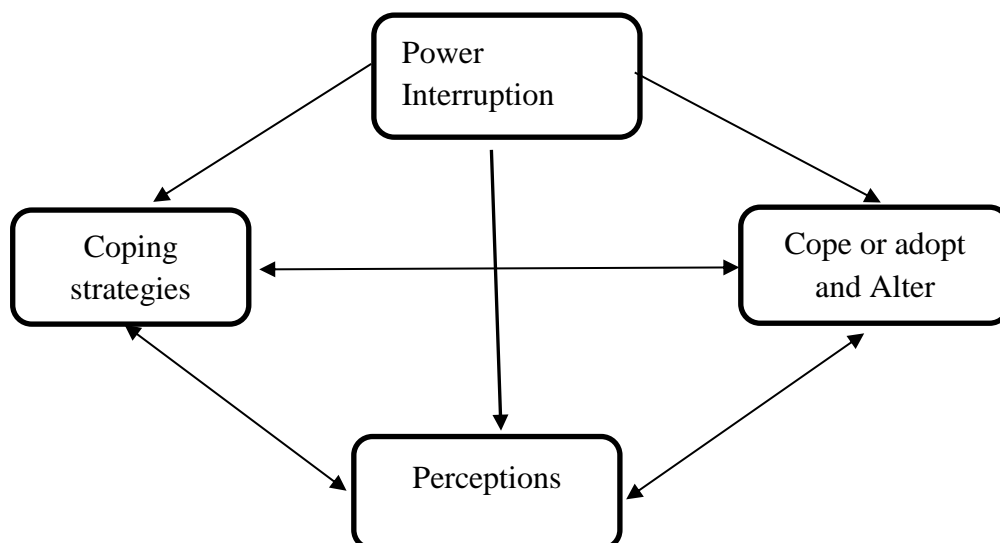
- a) The organization can adopt and change to fit environmental requirements.
- b) The organization can attempt to alter the environment so that it fits the organization's capabilities.

These two themes explain how the organisation can adopt or cope with the need of external resources or how organisation can alter the external environment in order to obtain the resources. These two themes are relevant to my study because the industry's coping strategies of electricity interruptions were either internal or external. The industry changes its working behaviour, structures and action to cope with electricity interruptions.

3.1.1 Conceptual Framework

This study draws on the work of Pfeffer and Salancik (1978) to develop a model for the application of RDT in study. I used the research title, objectives and the two themes from RDT to develop this model.

Figure 4 Conceptual Framework



The framework has been developed by using the research topic (coping with power interruptions) and two themes from RDT which are: the organization can adopt and change to fit environmental requirements and the organization can attempt to alter the environment so that it fits the organization's capabilities and the two specific objectives of the study (to investigate the perceptions and coping strategies of electricity users).

This model attempts to explain how the industry can cope with electricity interruptions in relation to RDT. It tries to explain the relationship between electricity interruptions, coping strategies and perceptions. The model explains that sometimes the perceptions of electricity users influence the coping strategies, which could be either internal or external.

Further, the conceptual framework showed how the two themes from RDT ties with some coping strategies. It can be seen from the conceptual framework that perceptions of the electricity users can influence the coping strategy to be either internal or external. For instance what the organisation perceives regarding electricity interruptions can lead the organisation to adopt either internal or external coping strategy. For example, staff from the industry perceives electricity interruption to occur due to high demand that supply that is during high and peak time there is no enough electricity. This perception has lead the industry to adopt an internal coping strategy of working night shifts and weekends where in most of the time there is electricity. Here it can be seen the influence of perception to coping strategy.

Further the coping strategies adopted by the industry to cope with electricity interruption ties with the two themes from RDT which guides the study. For instance the industry used the internal coping strategies such as employing part time and untrained workers is an attempt to adopt and cope with the power interruptions and continue with production as the main function of the industry. The use of part time and untrained workers is an internal coping strategy with ties with RDT theme which states that; the organization can adopt and change to fit environmental requirements. The industry modifies its internal structures and working behaviour to accommodate the challenge of electricity interruption and survive.

Moreover the conceptual framework can be used to explain the perception of electricity users and coping strategy adopted. For instance the findings revealed that electricity users attributes electricity interruptions with lack of communication with electricity producers(TANESCO).This has lead the management to initiate good communication with some TANESCO technicians where by the management gets information in case of any planned power cut. It was explained that keeping in touch with TANESCO helps the industry to get information early and arrange the work schedule. This is an external coping strategy adopted by the industry and much with the RDT theme which states that; the organization can attempt to alter the environment so that it fits the organization's capabilities. This theme is chosen to guide the study because it suits with the industry's external coping strategies.

In addition, the problem of power interruptions is perceived differently by the staff from the industry, how he/she understands the problem lead to certain perceptions. For instance interviewees from management level in the industry perceived power interruption as a government problem while those at lower level(line workers) perceived it as a problem caused by poor infrastructure. The difference in perceptions is associated with the knowledge about the problem and the extent the person is affected by the interruptions.

Management staff attributes electricity interruption with loss of revenue in the industry and even close of the industry. To them it is very important to develop coping strategies for the survival of the industry. Staff from lower level attribute it with their income and hard life because if no power no production in the industry hence no salary.

Another example of the external coping strategies used by the industry includes bribery to technicians from TANESCO in order to cope with electricity interruptions. The bribes would ensure that the industry get more time with electricity. The findings revealed that this strategy works for the industry, for instance whenever there is planned electricity interruptions, the technicians from TANESCO can chose not to cut power in the industry's area. According RDT, an organization can alter its external environment to survive. This example shows how the industry used bribery to reduce frequent electricity interruptions and continued with production. Therefore the conceptual framework can be used to explain the

relationship between the research topic, objectives and theory used to guide this study.

3.1.2 The Relevance of RDT Theory to the study

The RDT is based on the relationship between an organization's dependence on external resources and internal processes. In this particular study, the external resource is electricity and internal process is production process in the industry. This study is about electricity interruptions and how the industry copes with the situation. The industry depends only on electricity as a source of power for production. This study focused on the dependence of the industry on electricity TANESCO as the only source of power for production (internal processes).

The production in the industry depends entirely on electricity, however, this study revealed that there are frequent electricity interruptions; therefore the industry developed some coping strategies to survive. These strategies were either internal or external in relation to the two chosen themes from RDT. That, (a), the organization can adopt and change to fit environmental requirements, (b) the organization can attempt to alter the environment so that it fits the organization's capabilities.

The relevance of RDT is seen in this study whereby the industry adjust internal structures and alter external environment to cope with electricity interruptions in order to maintain production. The two selected themes from RDT which are central to this study are suitable in analysing the coping strategies adopted by the industry. Some of the industry's coping strategies are presented in the discussion chapter in relation to RDT.

4 Literature Review

4.1 Review of Studies on Interruptions in Power Supply

This chapter presents and synthesis relevant study on power interruptions from outside and within Tanzania.

4.1.1 Major themes from the Power Interruption Literature

Changing of Working hours

Electricity is crucial for production in many firms with or without alternative power supply. Experience shows that electricity from national grid is affordable during investment and even running of its infrastructures compared to generators, off-grid generation and other renewable sources (Sullivan, Terry and Mark, 1997; Alam, 2013; Hussain et al, 2012; Trulsson, 1997 and Fisher-Vanden 2012). Power interruption has been rated higher among the major constraints in industrial growth and country development. Industries in many developing countries are facing severe power interruption which affects production.

Due to the problem of power interruptions, industries have to change working time to night shifts and working over time, so as to continue production. A study by (Hussain et al, 2012) found out that 15.0 percent of industries in Punjab changed working time table to night shifts and 57.5 percent of industries adopted overtime work. Many small industries in Tanzania including the one under my study seem to use this coping strategy of changing working time table from day to night shifts.

Working Extra Shifts

Power supply and distribution in Tanzania and Africa faces major challenges. Power is necessary for any economic development in the world. But power supply in developing countries is unreliable. The industries have to work extra shift during off-peak hours, weekends and in late hours. This is seen in studies by (Sullivan, Terry and Mark, 1997; Alam, 2013 and Hussain et al, 2012).

In particular (Sullivan, Terry and Mark, 1997) observed that in dealing with power interruption in many countries, small industries have developed different coping strategies in coping power interruption. Among strategies which are manageable and cost effective is working extra time. Although working overtime help to maintain production, it also increases production costs in the form of overtime bonus.

Industry's Responses to Power Interruptions

The power supply in Africa and in developing world is characterized by interruptions and shortages. Due to electricity scarcity and unreliability industries opt to use part time and untrained workers especially in production unit (Cissokho and Seck 2013; Salm et al, 2011 and CTI, 2011). When there is power interruption, it is expected that there will low production. As part of the coping strategies to power interruptions, the above authors observed that industries use of part time and fewer workers. It was also found out that other industries employ untrained workers and part time workers. It is argued that paying full time and trained workers is expensive if there is power interruption. Therefore among coping strategies used to cope with power interruptions in many small scale industries is to use untrained and part time workers.

Poor and Worn out Infrastructure

Many studies indicate that power interruption is caused by poor and worn out infrastructure. In developing countries many power utilities are worn out. The infrastructures are neither maintained nor replaced (Moyo, 2013; Trulsson, 1997; CTI, 2011 and Salm et al, 2011). Electricity shortage is perceived to be caused by poor and

worn out infrastructures. Therefore, many countries of Sub Saharan Africa face the problem of power interruption due to poor and outdated electricity system.

The challenge of power interruption in Tanzania is associated to old infrastructures. All the infrastructure system from generation, transmission and distribution are old. Due to poor and old transmission lines and cables there is loss of power in the process of generation and distribution, this ultimately leads to power interruptions (CTI, 2011). Governments of Sub Saharan Africa recognized the infrastructure problem but the challenge is lack of capital to improve and change the electricity system.

Lack of Capital

Power interruption has been associated to lack of capital to maintain the existing facilities or buy new ones. In Sub Saharan Africa and developing world in general there is a problem of lack of funding in electricity sector. This is discussed by (Ikwaba and James, 2013; Cissokho and Seck, 2013 and Moyo, 2013;). It is argued that power interruption is a major problem facing domestic and commercial users of electricity in the world today. Many governments lack adequate funds to invest in electricity sector to improve reliability and accessibility of electricity (Moyo, 2013).

Use of off-grid Power Supply

Power shortage and power interruption are the major problems being experienced by many small scale industries. Power stability plays an important role in a country's development. For the industries to produce effectively, availability and reliability of power is crucial. According to (LaCommare and Eto, 2006; Hussain et al, 2012; Moyo, 2013 and Trulsson 1997) power interruption is a main challenge which faces industries in developing world. These scholars argue that some industries for example use off-grid power supply for production during interruption. In days with power interruption few industries outsource electricity from other sources like solar, generators and from self-generating agents to continue with production. Furthermore the use of alternative power supplies like generators, off-grid sources and solar helped the firms to cope with power interruption and continue production.

Further, alternative sources of power are expensive to most of the industries as well as private or domestic users. Electricity from off-grid and the use of generators is expensive compared to electricity from national grid. For instance it was reported that using generators due to power interruption costs \$50 billion to electricity consumers per year (LaCommare and Eto, 2006).

Dependency on Hydropower

In many African countries there are many sources of electricity like oil, solar, biomass, hydro and natural gas. Many studies about power in Africa and Tanzania in particular explain that one of the problems which lead to power interruption is over reliance on hydro as the main source of electricity (Paulo and Uhomoibhi, 2013; Trulsson, 1997 and CTI, 2011). All these studies confirmed that some industries experience power interruption due to lack of generation capacity. The problem of electricity in Africa is associated to its dependency on hydro source. In recent years, there is a problem of drought in many parts of the continent due to inadequate rainfall. The drought has also reportedly affected many dams leading to inadequate electricity generation. Due to Weather changes in the African continent, the problem of drought continues to pose a serious challenge to hydro electricity generation. Therefore studies have suggested that there is a need for African countries to use other sources of electricity available like oil, natural gas, solar and renewable energy.

Energy Policies

The energy sector like any other sector is guided by some policies, acts and regulations. Energy is important for development in social and economic aspects. Studies have shown that there is lack of specific policies on the rights of indigenous and foreigners regarding investments in energy sectors (ESRF, 2009 and Pegels, 2010). For example in Tanzania neither Tanzania nor Zanzibar has clear national petroleum exploration policy only partly being covered in National Energy Policy of 1992 and 2003. These contradictions in policies and regulations lead to conflict on ownership. While people knew that the gas belongs to them as URT 2003 states, in NEP 2003 states that minerals belong to government. The delay in the construction of the gas project from Mtwara to

Dar es Salaam which is expected to reduce power interruption in Tanzania is because of conflicting directives from the energy policies of the country.

In Tanzania currently there is misunderstanding between government and people of Mtwara. There is a source of gas in Mtwara; on one side, the government claims the gas to belong to the state while people from Mtwara claimed it to belong to them. This friction arises out of unclear energy policy.

The same problem of the gap between regulatory measures and existing policies is seen in study by (Pegels, 2010) in South Africa. It was argued that various arms of the government which work in the same sector have different policies guiding them. It was suggested that different organs of the government working together must coordinate their activities instead of conflicting each other in order to bring about electricity accessibility and reliability in South Africa.

Monopoly of State owned Company in Energy Sector

Monopoly of state owned companies in electricity sector is considered to be a problem which leads to power interruption. In many developing countries, the government own more than 95 percent of electricity sector (Ikwaba and James, 2013, Cissokho and Seck 2013, Pegels, 2010 and CTI, 2011). These studies indicated that power interruption is perceived as a result of failed privatization and lack of public investment. In Tanzania, Senegal and South Africa there is little privatization in energy sector, to a large extent the energy sector is under government ownership. At the same time, governments lack adequate funding for the energy sector to meet demand of the power in these countries.

Public investment in energy sector is still low thus power interruptions are inevitable in industries which depend highly on electricity for production. According to (Ikwaba and James, 2013) the problem of electricity in Africa is caused by failure of the governments to attract private sectors in generation and distribution of electricity.

The electricity companies which are state owned have the main functions of generation, transmission and distribution of the electricity in their countries. According to (Moyo

2013) power reliability and affordability in Sub Saharan countries is still a major challenge.

Moyo found that there was little investment in energy sector and in most countries in Sub Saharan Africa the energy sector is monopolized by the state. The monopolization of energy sector by state is perceived as a contributing factor for power interruption.

Higher Demand than Supply

Power reliability in any country is very important for the prosperity of its social and economic sectors including industries, agriculture, commercial, health, education and transportation and all infrastructures. The problem with power supply is faced with high demand due to population growth, growth in economic activities which use electricity as the backbone. The problem of electricity demand being higher than the supply affects many countries both from developed and developing world (Praktiknjo, 2014; Alam, 2013, Salm et al, 2011 and Trulsson, 1997). The authors discussed that when the electricity demand is higher than the supply, it is expected that there will occur power interruptions and this would happen in peak hours where much electricity is needed.

According to (Praktiknjo, 2014) who did a study about power interruption in Germany found that Germany is facing a big challenge in energy sector. There is a growing gap between electricity generation and consumption because the demand of electricity is high compared to supply.

Change of Industries to Smaller ones

The bigger the industry is, the more power is needed to run production and all other office works. Due to interruption in power supply, few industries decided to change to smaller industries with less electricity demand (Alam, 2013). The study discussed that in few industries under his study decided to close some units of production which were highly power demanding, for example the rice industry which closed some units and operated as a small industry with less electricity demand as a result of power interruption. Alam summarized that power outage affects the industry's production and slows down economic growth of the country at large.

Voltage Fluctuation

Power interruption is associated with many factors. Among them is voltage fluctuation. For the power supply to be stable there is a need of stability in flow of electric currency. Studies by (La Commare and Eto, 2006; Yamashita et al, 2008 and CTI, 2011) explained that voltage fluctuation is one of the causes of power interruption. When electricity voltage goes very high or very low there is a possibility of the automatic switch to go off so as to avoid damage in the electricity system. Voltage fluctuation may be due to line tripping due to over load, high flow of electric currency, and shortage of supply from generation stations and other technical problems. Moreover, voltage change which leads to power interruption because there is no reserve margin in many countries. For example after power interruptions there is need to restart machines, restart production process, lower return on investment and damage of equipment where by 3-5 percent of equipment are damaged annually in food industries (Dibom and Tamo, 2013). In the study by (La Commare and Eto, 2006) it was shown that in United States power interruption costs about \$ 79 billion annually.

Costs of Power Interruption

Electricity from national grid is less expensive compared to electricity from private sources like generators, energy –storage technologies such as batteries and flywheels. Researchers (Dibom and Tamo, 2013; Sullivan, Terry and Mark, 1997 and La Commare and Eto, 2006) investigate costs incurred by the customers due to interruption in power supply and report that different costs are involved. When there is power interruption it is expected workers to work extra time, over time whereby they will be paid over time bonus. Again costs may be incurred in repairing damaged machines, production lost during power off, cost of wages paid to workers with no work done and cost of operating back up generation. All these costs can be minimized by giving notice to customers prior to power interruption in case of planned power cut. It was found that giving notices regarding power interruptions will reduce cost by 19.83 percent (Dibom and Tamo, 2013).

The use of Energy efficiency Technologies

Studies indicated that small industries across developing world are faced with many challenges and among them are power interruptions. These industries have to continue production regardless of the power problems. Therefore some researchers showed that some industries are using energy efficiency technologies to maximize production within short period of power availability. A study by (LaCommare and Eto, 2006; Alam, 2013 and Fisher-Vanden et al, 2012) showed how some industries use energy-storage technologies such as batteries, flywheels and even outsourced production and good which are energy intensive. Although the use of energy efficiency as discussed in the studies ensure survival of some industries, it also increases their production costs, for example industries need funds to buy the batteries and flywheels as well as maintenance cost of these utilities.

4.2 Synthesis of Literature Review

The literature confirms that there is a problem of power interruption in the world and to a large extent in the developing world. Many studies which dealt with power interruptions discussed the costs of alternative power supply, causes of power interruption and coping strategies employed by different industries, however investigated very little on perceptions of industrial electricity users and electricity suppliers towards power interruption.

From the reviewed studies interruption in power supply is associated to poor generation, poor infrastructure, high demand than supply, poor implementation of energy policies, and lack of capital, voltage fluctuations and monopoly of state owned electricity companies in energy sector.

In effort to cope with the problem of power interruptions, industries are adopting different strategies to such as employing part time and untrained workers, working extra shifts , over time and during weekends, use energy efficient technology, use of power from off-grid and private agents.

The perceptions of electricity users and electricity suppliers are important towards developing coping strategies of power interruption which is a focus of my study. From that point this study will examine the perceptions and coping strategies employed by one small scale industry in Moshi. The findings from the study will contribute to the existing body of knowledge about the perceptions and strategies used to cope with electricity interruptions in the small scale industries.

5 Methods

This chapter presents the methodological approach and the justification. The case study research design is then presented, followed by the sample of the study and the data collection techniques. It then presents the data analysis procedure. The chapter ends with a reliability, validity, ethical issues and limitations of the study.

5.1 Methods used

There are three types of research methods namely, qualitative, quantitative and mixed method. According to (Creswell, 2003) a qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist or advocacy/participatory perspectives or both. It also uses strategies of inquiry such as narratives, phenomenology, ethnographies, grounded theory studies, or case studies. Whereas quantitative approach is one in which the investigator primarily uses post positivist claims for developing knowledge. Quantitative approach employs strategies of inquiry such as experiments, surveys and collects data on predetermined instruments that yield statistical data. However mixed methods approach is one in which the researcher tends to base knowledge claims on pragmatic grounds. It employs strategies of inquiry that involve collecting data either simultaneously or sequentially to best understand research problems.

This study adopted qualitative approach, according to (Yin, 2011) qualitative research approach helps to study a phenomenon in its real-world setting, discover how people cope and thrive in that setting and capture the contextual richness of people's everyday life, the approach includes participant observation, direct observation, interviews, document analysis, case study, and focus group discussion. He further explains that it also enables the researcher to conduct in depth study. Another qualitative scholar argued that qualitative research analyses phenomenon without specifically measuring variables even though the data can be expressed numerically (Wimmer, 1990). This study adopted qualitative approach because the objective was to get detailed information

about coping strategies of interruption in power and perceptions of interviews from industry and TANESCO.

The limitation of qualitative approach is that, it is difficult to generalize the findings to the larger society. This is because it involved small sample scale. Its advantage lies on ability to get in-depth information of the situation or case under study (Patton, 1990:14).

Justification of using qualitative method in this study

The nature of research problem in this study falls in qualitative tradition, since the study sought to explore peoples' perceptions towards interruption of power supply. In accordance with (Strauss and Jackie, 1990:19) any research that attempt to explain persons' experience with phenomenon is better explored using qualitative methods. Also this method can be used to uncover and understand what lies behind any phenomenon about which little is known where in my study little is known about perceptions of electricity users in small industry and electricity producers.

I used qualitative methods (semi structured interviews, observation and document analysis) so as to get comprehensive information about workers' perception towards interruptions in power supply. Also this study needed to examine the coping strategies employed by the industry. Thus it might have been difficulty to express in numbers using quantitative method. Interruptions in power supply in industries are among areas which are under researched in Tanzania. Therefore using qualitative methods to explore in-depth information in this area was crucial.

5.2 The Case Study Research Design

A research design is the frame work used to collect and analyse data to answer research questions (Bryman, 2012). Some scholars mentioned different types of qualitative research designs including narratives, phenomenology, ethnographies, grounded theory studies, or case studies (Creswell, 2003). Each design has advantages over the other depending on the type of research question, objective of the study, the extent of control

an investigator has over actual behavioural or events and the degree of focus on contemporary as opposed to historical phenomenon (Yin, 2003:5.)

According to (Bryman, 2004:48) a case study is the detailed and intensive analysis of a case which could be school, family, events, person or organization. Case study design allows investigators to retain the holistic individual life cycles, small group behaviour, organizational and managerial processes, school performance and maturation of industries. In all these situations a case study is used to contribute to our knowledge of individual, group, organizational, social and political related phenomena (Yin, 2009).

Moreover (Yin, 2003:9) argues that case studies are best used when seeking to answer “how” and “why” questions about contemporary events over which an investigator has little or no control. In most cases research design aim at answering at least four questions: what question to study, what data are relevant, what data to collect and how to analyse the results (Yin, 2009). Also another scholar (Patton, 1990:54) contributed to the view that case studies enable a researcher to understand a particular problem or unique situation in detail and in a very specific actual context.

This study employed a case study because it involved only one industry and the one electricity company office as the cases in point. Case studies are helpful when researcher needs to capture individual differences or unique variations (Patton 1990:54). Also Patton mentioned, case studies are particularly useful when it comes to understanding of special people, particular problem or unique situation in great depth and where one can identify cases which are rich in information. These arguments over case studies add more value and strength on the use of case study research design in my study.

This study adopted case study design so as to understand how coping of power interruptions is done in one of the small industry located at Moshi. (What are the coping strategies of power interruptions adopted by the industry)? Also the study specifically sought to explore perceptions of staff towards power interruption in a specific context of one industry and one TANESCO office. This research design helped me to stick in specific place that is in the industry and conduct interviews and observation. The study

was done in actual and real situation when there was power and during interruptions in power supply.

However no one research design is perfect and fulfils all the requirements of a study. For that reason, case study design has been criticized for lacking rigor, that is inability to follow systematic procedures or has allowed ambiguous evidence or biased views to influence the direction of the findings and conclusions. Second criticism in case study design is that, this research design provides little basis for generalization to the population. In dealing with criticism facing case study design some scholars who advocates for qualitative case study design (Yin, 2003:10) explain the possibility of generalization of case study findings to theoretical propositions than to populations or universes.

5.3 The Sample of the Study

A sample refers to a sub set or sub segment of the population that is involved in the study (Yin, 2011) .The sample in this study comprised of eight respondents, three were from TANESCO and five from the industry. The group consisted of 2 female and 6 male with different working experience varies from 7-19 years. The study used purposive sampling technique. Purposive sample includes subjects selected on the basis of specific characteristics or qualities and eliminates those who fail to meet the criteria (Wimmer and Dominick, 1983:61).

Through purposive sampling I chose eight interviewees who were anonymously assigned pseudonyms names such as Nick, Norbert, Nicolaus, Neila, Norbeta, John, Joel, and Jerry.

Nick, this interviewee was chosen purposively because of his position; he is the owner and managing director of the industry, seven years working experience since the industry started, and the management information needed to answer the research question.

Norbert was chosen because of the accountant position in the industry and also he is the one who manage most of the industrial information on especially on sales.

Nicolaus and Neila were selected purposely because they belong to the unity which is affected directly with power interruption so they are reliable source of information on research question.

Norberta was chosen because of working experience and need to bring about gender balance in the study.

John, Joel and Jerry were selected based on there working experience, position and department they belong which is emergence and maintenance in TANESCO. This is the department which mainly deals with interruption in power supply which was the main objective of the study.

All participants were eligible for the study as they have specific needed information depending on the posts, department and working experience in the organizations in relation to research questions and objectives of the study.

5.4 Data collection techniques

In this part description of how data was collected and various techniques used will be explained.

5.4.1 Interviews

The interviewees were in two groups, three from TANESCO and five from the industry where as I interviewed two female and six male. The age lies between 20 to 50 years. The interviewees included workers from all level that is top management to lower level of line workers. Their working experience ranges from 7 to 19 years and education level from primary certificate to degree level.

Interview is a common method in qualitative research and it allows the researcher to gather a large amount of in depth data and information. Regarding to the interview (Kvale and Brinkmann, 2009) assert that an interview is a literally, an inter-change of views between two or more persons discussing about a theme of mutual interest with the purpose of producing knowledge.

Moreover (Cohen, Lawrence and Keith ,2007) define research interview as two person conversation initiated by the interviewer for the purpose of obtaining research relevant information and focused by him/ her on content specified by the research objectives of systematic description, prediction and explanation.

There are three types of interviews such as structured interview, unstructured, semi-structured (Bryman, 2004; 2008).In this study I used semi-structured interviews. Semi-structured interview is the type of interview where the researcher has a list of key themes, issues, and questions to be covered, often referred as an interview guide

Semi-structured interviews has several strength as discussed by (Kvale and Brinkmann, 2009), first there is the possibility of the participants to respond in their own words and express personal perspectives Second through semi-structured interview is possible to obtain in depth information. Thirdly, there is opportunity to formulate implicit messages and lastly it has the advantage of reformulation and clarification of questions to the participants.

By the use of interviews it is possible to elicit the actual thoughts of the participants, secure data that are not available in performance, records or data which are difficulty to obtain by written response or observation (Kvale, 1996). Moreover (Cohen and Lawrence, 1994) suggest that participants may be reluctant to list their information in the written form but they will volunteer the information to a skilful interviewer who asks the right questions and probe for more information.

In this study interview was a major technique for data collection. The interview provides significant information about perceptions of both industrial electricity users and TANESCO towards power interruptions. Interviews again supplement and support data obtained from document analysis which shows different strategies used by the

government in coping with interruptions in power supply. Also semi-structured interview helps to get information about coping strategies of interruptions in power at the industry.

Administration of interviews

During interview sessions, interview guide was used with great flexibility. This means that questions were either asked in ascending order or randomly. This depended much on the situation, but I managed to ask all questions. According to (Kvale and Brinkmann, 2009) explained that the main objective of using interview guide is to ensure and help the researcher to have a focus of the major themes. In addition (Gillham, 2005) suggests that in semi-structured interview the interviewer asks all the interviewees the same questions. The idea behind is to reflect on the same questions so that the interviewer is able to give or develop supplementary questions where there is insufficient information. During the interview sessions probing for more information and eye contact with note taking was always maintained by the researcher.

One session was conducted at a time with one respondent. Number of breaks within the session was taken by the respondents due to other responsibilities that urgently needed their attention.

Interview time varies according to respondents' awareness about the topic under study but each took between 40 minutes to 1 hour. Recording was taken when the environment allowed. Most of the time in interview sessions, environment was very noise with a lot of inconveniences. Therefore recording was done only in few sessions where it was possible. Respondents were asked by the researcher to be free to add any comments out of the research guide in relation to the research topic. In closing of the interview session the researcher asked respondents if there were any more comments and they were given a chance to ask any question to me.

Interviews as many other data collection techniques have the limitation such as there is a risk of being subjective and biased, is time consuming in data collection and analysis and last it is cost full in the sense that the researcher need to be physically at the research site (Bryman, 2008).

5.4.2 Observation

In this study, observation as a qualitative data collection technique has been employed in order to get detailed using full information. Observation enables the researcher to study the peoples' interaction and behaviour in their real life setting in order to reveal their social reality (Wimmer, 1990). In using this technique, the researcher may decide to either use non participant observation or participant observation. According to (Fred and Nicholas, 1991) non-participant observation is the one which the researcher is not part of the observed society or process and the observed may sometimes not be aware of the researcher. In participant observation the researcher becomes part of the society or process. Here the researcher stays in the society observing behaviour, listening to formal and informal discussions and have chance to ask some more questions to add important information. Further (Patton, 1990) argues that data from this method consists of detailed descriptions of peoples' behaviour, attitudes, actions, a range of interpersonal interactions and organizational processes that are part of observable human experiences

I employed non-participant observation and visited TANESCO office at Moshi and the industry. I managed to have time in the research site to observe how work is done in days with electricity and during power interruption. I stayed in production unit for some hours each day of visit for observation purposes. It helped me to observe and get important information for my study.

However the workers being informed by the Nick of my presence as a student from abroad did not affect the observation. Since I am from the same community where the industry is located and speaks the same language (Swahili) interviewees were very comfortable and cooperative. I became a friend, sometimes it was possible to discuss about other social life agendas out of study topic especially in days with power interruptions in the industry.

It has been acknowledged that observation technique is usually not expensive; in most cases field observation requires only note book and pen (Patton, 1990). Being conducted in a natural setting it provides data rich in details and sensitivity.

Observation technique has however been criticized by some scholars. Criticism of this method includes relying much on the researcher's perception and judgment about the material under study. This might lead to the distortion of the preconceptions of the researcher about the study (Wimmer and Dominick, 1983). This can be avoided by engaging more than one technique or one observer to get detailed information to answer research questions. I avoided the criticism by engaging two more data collection techniques than observation that is interviews and document analysis.

5.4.3 Document analysis

Different documents from TANESCO and MEM were analysed and I got general information of electricity status, problems facing electricity sector and causes of power interruptions in Tanzania. The information about accessibility, affordability and reliability were obtained from these documents. These documents include reports and papers which present the problem of power interruption in Tanzania and different strategies of reducing them. Also the documents show plans of the government in improving electrification rate in Tanzania where there are huge electricity projects in actions like REA, JAICA and Mtwara gas project, just to mention few. The aim is to improve electricity accessibility and reliability and bring in power stability in the country.

Further, different articles and books related to electricity and power interruptions in developing countries and Tanzania in particular were analysed and helped to back up the study. The information from the documents might have been extremely difficult to collect through interviews or observation. Documents are rich and basic source of information about many programs, provide valuable information and stimulus that may not be retrieved by observation (Patton, 1990). Reasonable amount of information was from uio.no library data base, internet (Google scholar, jstor and oria), web site of government institutions such as TANESCO and MEM.

5.5 Data Analysis Procedures

According to (Kerlinger, 1986) data analysis is the process of bringing order, structure and meaning to the mass of unstructured data in order to obtain answers to the research questions. His emphasis was that methods employed in data analysis should be consistent with the research tradition.

This study generated data qualitatively and they were analysed qualitatively. Data were transcribed and grouped into themes developed from the two specific objectives of the study. As such, first I transcribed the data from interviews, followed by the data from recorder. Since the language used in interview was Kiswahili, I translated the data excerpts into English. Transcription was done every day in the evening so to remember all important information. Data from observation were transcribed and added to those from interviews. It is argued by (Kvale, 1996) on transcription rule that, it is important to do transcription of the interviews as soon as possible after interview, clearly identifying tapes and transcripts and not letting the tapes accumulate .I practices this rule and it was helpful to put together all the important information for this study.

5.6 Reliability and Validity

Many scholars have discussed about reliability and validity of qualitative research from different fields of such as psychology, philosophy and social sciences. According to (Kvale, 1996) reliability pertains to the consistency of the research findings which should be observed in all the research stages whilst validity pertains to the degree that a method investigates what it is intended to investigate. Validity involves at large issues of truth, correctness and knowledge.

According to (Neuman, 2011) reliability means dependability or consistency; if the same thing or study is repeated or recurs under the identical or very similar conditions the results will be the same while validity is truthfulness. It refers to how well an idea ‘fits’ with the actual reality. In maintaining reliability the researcher use multiple techniques in data collection; interviews, non-participant observation and document analysis to make sure and crosscheck the consistency in data. Scholars (Howard and

Bruce, 2012) discussed that triangulation is a method which involve multiple data-collection techniques designed to measure a single concept in the study.

Reliability addresses the question of how well we measure social reality using our construct .In qualitative research reliability is maintained by the use of various techniques in data collection to check the consistency of data. Whereas validity in qualitative research is more interested in achieving truthfulness; get a fair, honest and balanced account of social life from a viewpoint of those who live it every day, than realizing a single version of truth (Neuman, 2011:214).

I maintained validity in this study by preparing the interviews guides which were checked by my supervisor, and I corrected all errors which were mentioned by the supervisor .

In addition, I did an informal pilot study at one of the small scale food processing industry located in the same area with the industry in this study. The pilot study helped me to crosscheck if the instrument that is the interview guide will be understood by the interviewees of the intended industry under this study. It can be said that this study is valid; according to (Neuman, 2011) explanation of validity which relies on truthfulness in everyday life .This study intended to get in depth information on perceptions of interviewees together with coping mechanism of power interruption in a real and everyday social life in the industry and TANESCO.

5.7 Ethical Issue

In most cases qualitative research involves human being in study, so ethical aspect is of greater importance. It should be considered from the beginning to the end of the study. According to (Thomas and Jack 1990:370) “the researcher must give a greater deal of thought to these matters before collecting data and must be able to explain the significance of the study effectively and convey the importance of the subject cooperation in the language that the subjects can understand.”

Another scholar (Punch, 1994) posts that, ethical issue in research includes harm, consent, deception, privacy and confidentiality of data. There is difficulty in maintaining all the issues but is very important for every researcher to protect the respondents against harm because of participating in the study. Researchers should practice confidentiality and informed consent. Also researchers must be aware of the necessary ethical standards which should be observed to avoid harm which might be caused by carrying out or publishing the results of the research project (Kvale, 1996).

This study dealt with interruption in power supply and involves interviewees from TANESCO and from the industry. To abide with ethical issues I asked for a letter from the Supervisor Tanya Winther of University of Oslo. I took the letter to the Regional Commissioners' Office in Moshi -Tanzania to ask for a permission to do field work at TANESCO head quarter Moshi as well as in the industry. Thereafter I was given an introductory letter from the regional office which explained the aim of the study and asks for cooperation from the TANESCO and the industry. I took the letter to the Principal Engineer at TANESCO-Moshi and to the Managing Director of the industry. After all these formal procedures I was allowed to do the field work in the two intended areas. In maintaining ethics of research, I prepared an informed consent form for every interviewee.

In making sure that ethical issues are practiced, in every interview session I explained the objectives of the study to the interviewees and gave the explanation about the informed consent form. All interviewees agreed to be interviewed without signing the informed consent form after being introduced by their leaders on the aim of the study. I told the interviewees about the freedom to drop from the interview session any time if they feel uncomfortable. I also ensured anonymity of the interviewees as their names are not in this report to protect them from any inconvenience. The data were kept safely and nobody is allowed to access them apart from the researcher and the supervisor.

5.8 Limitations of the Study

This study like many others is not free of limitations. The following are some of the limitations of this study. First, there was the challenge of time constraint to complete the

project. To counter this limitation, the study was conducted on one industry and TANESCO regional office in Moshi. Since this study was limited to few respondents, it was not expected to represent all information on coping strategies and the perceptions of electricity users in industrial sector in Tanzania. Regardless of the study been limited to few respondents still the information on perceptions and coping strategies adopted by the industry reflects the situation of many small scale industries in developing countries as it is seen in literature review chapter.

Second my personal bias has affected the choice of area of study. I opted to choose an industry in Moshi which is my home town so as to stay with the family while conducting the study. This helped me to conduct the study comfortably and economically use my limited resources. To deal with bias in my study, I used a triangulation to collect data whereby I employed interview, observation and document analysis techniques.

Third there was difficulty in getting documents from the industry. This was because in the industry under study had no any well-organized written documents like reports and any office information. However, I was able to get valuable information from other secondary sources like libraries, journals and articles.

Fourth it was difficulty to get some information from Tanzania government websites such of TANESCO and MEM. Some of the needed documents were either not available or outdated so I need to keep finding the updated ones. In order to get updated documents and the once missing I had to contact some people from MEM in Dar es Salaam and travel to Dar es Salaam which was costly in terms of money and time. At last I managed to get useful documents for this study.

6 Data Presentation and Analysis

This chapter presents area under study and analyses the major findings of the study based on two objectives. These are perceptions of electricity users and producers and coping strategies employed by the industry.

6.1 Area of Study

The industry in this study is located in Moshi municipal in Tanzania. It is a small scale industry within half a hectare. The industry is private owned and it deals with production of animal food. The industry was established in 2008. It is located 5.5 kilometres from Moshi town and just 100 meters from Moshi–Arusha highway at Kibosho road junction.

This industry mainly deals with production of animal food such as chicken food products for example; broiler starter, broiler finisher and layer mash, other animal foods include pig meals, dairy meal for cattle and super dog for dogs. All these foods are packed in bags of 25 and 50 kilograms.

6.2 Administrative Structure of the Industry

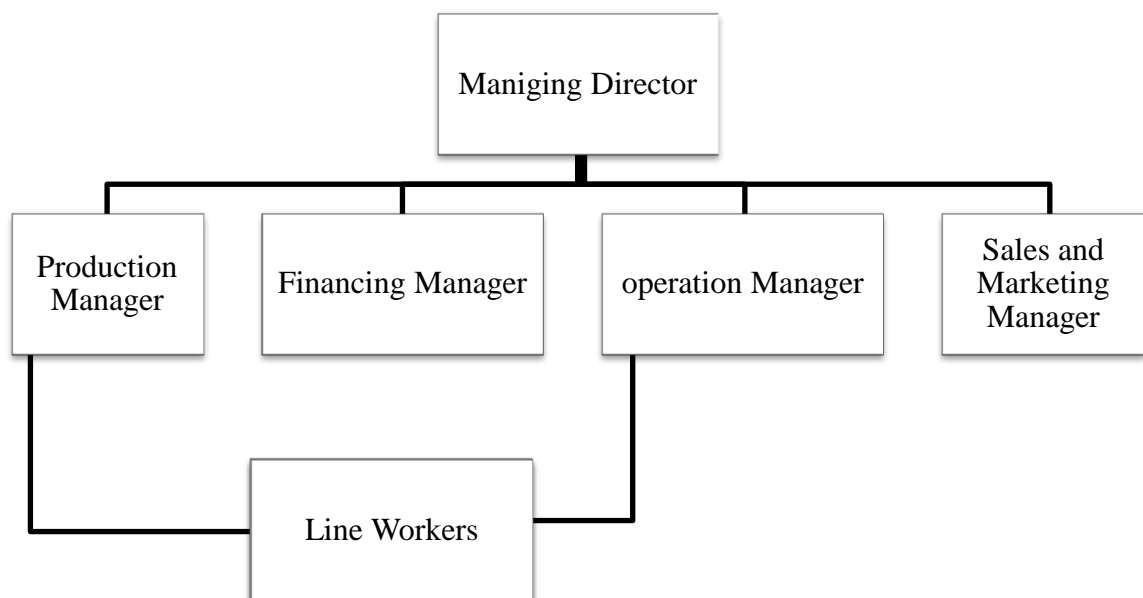
The administration hierarchy of the industry is divided into three levels. The top post is managing director followed by production, financing, operation, sales and marketing manager level and last is the line worker level. All top posts belong to the male. Three female workers in the industry belong to receptionist, front office assistant and a cook positions.

The industry comprises of twenty two workers. Only Nick and Nicolaus are professionally trained full time workers. The rest have been trained within the industry and work as part time employees. Nick is a multi-task person performing any work from

any department when necessity arises. For example Nick was supplying food to the customers in absence of the industry's driver in one of the days during field work.

The managing director who is the owner of the industry takes care of all administration works. The administration work is done in a single small office located within the industry. This office is also used for all other industry's works. It is used by accountant, sales manager and production manager for their different works. All the industry's administrative works, customer care services and other office works are done manually in the small single office located within the industry; there is no use of computer. The administration hierarchy is summarized in the figure below

Figure 4 Administrative Hierarchy of the Industry



Source: From the industry

This industry like many other industries in Moshi municipal and Tanzania in general depends on electricity from TANESCO as the only source of power for production. There is no alternative power supply in case of electricity interruptions in the industry.

The findings are organized and presented in the two main themes following the specific objectives of the study. These include perception of interviewees from the industry and

TANESCO towards power interruption and coping strategies of power interruption adopted in the industry. These themes were further sub divided into sub themes as shown.

6.3 Perceptions of Interviewees towards Interruption in Electricity Supply

The first objective of the study sought to explore perceptions of interviewees from the industry and TANESCO on interruptions in power supply.

6.3.1 Industry's Perspectives

Government Fault

During field work in the interview session Nick from the industry expressed his perceptions over interruption in power supply that, the problem is caused by the government. The government does not give enough attention to the problem. In Tanzania electricity is mainly from hydropower which is not adequate and it is subjected to drought. Other sources like gas and coal are underutilized. He added that everything in Tanzania involves politics even matters like interruption in power supply is not treated seriously. Here is his explanation;

“....power interruption is a big problem which is not given enough attention by the government. Power interruption is taken lightly in political forums while is the problem affecting many people. We depend much on hydropower while we have many other sources like gas and coal.”

Also during interview session another interviewee Norbert had more explanation on government fault as the source of interruption in power *“...interruption in power supply is caused by the government which depends mainly on hydropower where by during dry season there is much interruption in power”*

Further during field work in one of the in the interview session Nick insists on government lack of efforts to solve power interruption in Moshi as the source of electricity interruption problem, he said;

“...our government is lazy and not responsible to the citizens when it comes to power supply. Interruption in power is solvable if the government decides to work the problem out not by the style of raising electricity price of electricity as a solution because is not working at all”

From the interview excerpts it seems that there is lack of commitment in part of government in making sure that electricity is reliable and reduces over dependence on hydropower as the main source of electricity. So when there is lack of water especially during dry season the problem of power interruptions increases.

Unimplemented Energy Policies

In Tanzania there are energy policies which are just on paper but not implemented. In Tanzania there are very good policies concerning power supply for example how to improve electricity accessibility and reliability and Nick said, *“....madam, power interruption is associated with unimplemented energy policies in Tanzania. I believe we have very applicable policies of which, if are implemented we will reduce to a large extent interruption in power supply.”*

Concerning energy policies Noberta added this *“...it is very strange that we are using government money and tax from poor Tanzanians to pay Member of Parliament to construct policies which are not implemented”*.

From the above interview quotations it seems that unimplemented energy policies contribute to the problem of interruption in power supply. It is argued that the policies are not well implemented by the government through MEM and TANESCO to ensure reliability of electricity supply in the country. They are just in papers kept in the offices but are not working to improve electricity supply situation in Tanzania.

Corruption and Inequality in Power Supply

Findings from interviews revealed that power interruption is created by some people who benefit through the generator business. In Tanzania there are many sources of power but corruption from big business people and top leaders who sell generators perpetuate the problem to make profit out of it as seen from a quote from one of the interviewees “...if interruption in power supply is a problem which affects all people equally the government would have solved it. Some few government leaders collaborate with big businesses who sell generators and solar panels. It seems that the whole system is corrupt when it comes to power. In reality people at grass root are the ones who suffer from interruption” Nicolaus said.

Again it has been claimed by interviewees that, some areas with big companies owned by political leaders and big business people; who in a way control government do not suffer much from interruption. Their areas are always supplied with power and alternative standby generators. Norbeta said that “... at least all the areas occupied by political leaders and big business people are not affected by interruption in power supply compared to other areas”.

Through experience as a Tanzanian, I had the same experience that in many areas occupied by big business people and political leaders there is limited interruption in power supply. From the above quotations it is clear that the government leaders and business people who are corrupt have contributed to the problem of interruption in power supply through generators and solar panel business. In case of inequality some areas are favoured for example, areas where government leaders and big business people are not affected much with power interruption as it is in areas dwelled with middle and low socio- economic status.

Lack of Capital to Improve Electricity Infrastructure

In dealing with interruption in power supply, government needs huge capital. The problem is associated with poor infrastructures which are very old. The system has not been changed over long time and this contributes to frequent power breakdown. In

times of heavy rain or strong wind the interruption is very high because many pylons fall down. Nicolaus explained that,

“...in improving interruption in power supply TANESCO needs to change the infrastructure which are old and fall easily during rainy season and wind days. It needs huge capital which if the government decides is possible to raise the money for renovation”.

Another interviewee John from TANESCO explained lack of capital as a big problem facing TANESCO and contributes to interruption in power supply. He said *“...we have a serious problem of infrastructure in our company. TANESCO recognizes this problem but we have the challenge lack of fund”.*

A press conference with TANESCO regional manager of Kilimanjaro done by business times concerning problem facing the company, Engineer Joshua explained that, some difficulties facing TANESCO includes lack of fund to replace worn out system infrastructures in TANESCO *“the interruption in power supply is contributed by lack of capital to replace poor infrastructure. The electricity company recognizes the problem and we have the plan to renovate electricity infrastructures all over the country.”* he said (Business times, 2011).

Interviews excerpts above and document implies that TANESCO is faced by the problem of lack of funding for electricity infrastructures renovation. It is argued that the government is aware of the poor infrastructures and has is plans to renovate and replace the worn out electricity system in order to improve power supply.

Lack of Cooperation between TANESCO and Customers

Some interviewees from the industry perceived interruption in power supply to be associated with poor cooperation between TANESCO and customers. This is because customers have no forum to speak out their views and suggestions on solving this problem. When breakdown occur, it is not normal for the customers to report to TANESCO even if it is dangerous .This sometimes takes long time for the company to

get information and results into delay to fix the problem. Regarding the problem of lack of communication Neila had this to say;

“...there is no direct communication between us [customers] and TANESCO because we don't have TANESCO's telephone number. Information about interruption in power supply is written in newspapers which most of the time do not come on time. In order to reduce the problem of long-time interruption which can be easily fixed there must be direct communication between customers and TANESCO. Customers views should be considered because we [customers] are the victims”.

Moreover I interviewed Norbeta from the industry and she had the same perception on lack of communication and cooperation between TANESCO and customers as one of the contributing factor to power interruption

“...it is very difficult to communicate with TANESCO during interruption in power supply. For example when a customer see a pole which has fallen down is not easy to inform people at TANESCO. In addition even if you strive to inform them it is likely that they will not come or they come very late to fix the problem” (Norbeta presented).

These quotations from the interviews indicate that there is a problem of communication between TANESCO and customers. However, regardless of interviewees from the industry mentioned, that there is no telephone number for customers to communicate with TANESCO offices, the emergency numbers are available in the receipt or electricity bills, in the TANESCO website and in most of TANESCO brochures. It seems that the interviewees from the industry are not aware of availability of the telephone numbers. There is need of these two groups to work together so as to minimize interruptions in power supply.

Monopoly of TANESCO in Supplying Electricity

Monopoly of TANESCO in power generation, transmission and supply has been perceived by the interviewees from the industry as a contribution factor in power interruption. Up to now there is no any company which supplies electricity directly to the customers. The existing private electricity companies such as aggreco and

Independent Power Producer (IPP) generate and sell electricity to TANESCO for distribution. Nicolaus explained that *“...in order for TANESCO to perform effectively there is a need of privatization to allow business competition. In mobile phone companies there is a good service because of competition due to presence of many companies”*.

However Neila argued that domination of TANESCO in generation, transmission and supply of electricity contributes to interruption in power supply *“... In Tanzania electricity supply is done only by TANESCO. No competition in providing electricity services since every all customers from depends on TANESCO. I wish we have more than one company may be the situation can change”*.

The interviews quotations show that monopoly of TANESCO in power supply is perceived to be one among the causes of power interruptions. It seems that there is complacency due to lack of competition in power supply. The interviewees from the industry proposed the country to have many companies in electricity sector to improve the service and encourage competition.

6.3.2 TANESCO’S Perspectives

Likewise interviewees from TANESCO gave the following perceptions on power interruption. From TANESCO, power interruption is a manageable problem which is caused by voltage fluctuations, poor infrastructures, maintenance and lack of capital.

Small and Manageable Problem

Interviewees from TANESCO did not seem to look at power interruption as a big issue in Moshi; they said it is a manageable problem compared to other regions of Tanzania. During interviews, “Joel” and “Jerry” from TANESCO explained that, interruptions in power supply are a small and manageable problem in Moshi, *“if we are to talk of interruption in power supply and is at very minimal level in Moshi. These people are blessed and they have power long time just after independence. No much interruption compared to other regions like Lindi and Mtwara”* said Joel

Moreover interviewee Jerry adds that “*interruptions in power supply here in Moshi use to happen very rare and I may say it has little effects to our customers*”.

From these interviews excerpts it is seen that according to TANESCO interviewees, the problem of interruption of power is very minimal so it is easy to control. It is perceived not to be a big problem especially when they compare with other regions of Tanzania. I from the same area under study I experienced interruption in power supply during field work; it is serious problems which affects customers especially small industries with no alternative power supply.

Voltage Fluctuations

Interruption in power supply is also perceived being caused by fluctuation in voltage capacity. There are times during transmission of electricity from the station to the distribution line when the voltage changes. When the voltage is very high or very low the electric switch can go off automatically to avoid damages in the system. Jerry argued that “*...voltage fluctuations can cause power off. When voltage is either very high or low the automatic switch need to go off to avoid damages.*”

In a document review, I found in (TANESCO, 2011) that voltage fluctuation has been discussed as a cause of electricity interruptions. In this report it is stated that during transmission of power, there may occur raising or lowering of voltage capacity. In that process of electricity transmission, if the voltage goes very high or low then there is a possibility of switching off of electricity flow to avoid damages or insufficient load carried and hence failure in supply of sufficient electricity.

From interviews and document review it is noticed that sometimes during transmission there is voltage fluctuations which often lead to automatic electric switch to go off and result into interruption in power supply.

Planned interruptions

Interviewee from TANESCO perceived interruption to occur due to maintenance activities. Electricity infrastructure need to be maintained in order to function properly.

When the company plans to renovate the system, customers are given notice in advance on dates and time when the power will be cut off through media “...*normally we use to renovate the system after every four months, in doing so we need to cut off power. Costumers are given notice through media*” John said.

In addition Jerry from TANESCO added the following in supporting power interruption to occur in Moshi to due maintenance reasons. He presented that “...*in reality our electricity infrastructure are very old, sometimes TANESCO had to cut power supply in order to do maintenance. Customers are given notice seventy two hours prior to power cut off through the media*”.

However Nick an interviewee from the industry complained that power interruption notice are not given to them. It’s very rare we get the notice of power cut off and if given is always late. Nick an interviewee from the industry explained that ...“*TANESCO do not give us notice on power interruption. It’s me who call them when there is no power to know if it is for long or short time so that I can inform my employees*”.

Through observation the researcher found out that, there was eight hours interruption on 07/09/2014 at Sombetini area due to transformer maintenance. It was announced through Tanzania Broadcasting Television (TBC) and Independent Television (ITV) a day before.

The excerpts from interviews indicate that there are different explanations on notice giving. The interviewees from TANESCO explained that during planned interruption, customers are given notice prior the interruption while interviewees from the industry claimed that they were not given notice and if they got the notice mostly, they came so late.

I observed that, before the interruption of 07/09/2014 notice was given a day before. From this observation it can be said that sometimes TANESCO gives notice during planned interruption, may be the problem is absence of media like television, radio and internet in most of rural areas including the area where the industry is located.

High Demand of Electricity than Supply

TANESCO depends much of its electricity from hydropower as a major source. In case of any insufficient water there is low production of electricity which results into low supply. With population growth and new connections the source is not enough and therefore sometimes power rationing occurs. The substation which supplies electricity to Moshi was built in sixties and it is used until to date. In those days there was only one industry in Moshi. Currently there are more than fifteen small and medium scale industries and the substation is still the same with only minor modifications. Joel from TANESCO said “... *TANESCO depends on much of its electricity from on hydropower. During dry season there is shortage of water which results into low production of electricity .Low production sometimes leads the TANESCO to have a schedule of power cut off “* .

Another addition was from John who said that “...*electricity produced is low compared to consumers’ demand. The source which is used is the same from 1960’s with the todays’ population growth and new connections”* .

These quotations from interviewees shed more light on their perceptions on interruption in power supply. According to these interviewees, it is clear that the demand of electricity is higher and supply is low. This leads to power rationing by TANESCO causing power interruptions.

Theft of Electricity

In the interview sessions interviewees from both TANESCO and the industry perceived power interruption is a result of theft of electricity equipment and illegal connections. When either of this theft happened, interruption in power supply is a must. The following is the quotation from TANESCO interviewee “...*the problem of interruption in power supply is caused by thieves of electricity infrastructure and transformer’s oil. Some of the TANESCO technicians conduct illegal connections to customers which lead to overload in the transmission line hence power cut off”* Jerry presented.

Further, John had some information to add on theft of electricity by unfaithful workers as a contributing factor in power interruption. He said *“few of unfaithful fellow workers from TANESCO steal electricity infrastructure and offer illegal connections to customers after getting some money”*.

Moreover the literature review indicates that theft of electricity is a problem in Tanzania. In a speech by Badra Masoud the TANESCO Communication and Relations Officer at Dar es Salaam 2013, addressed that among challenges facing TANESCO is its operations is thieving done by the unfaithful staff and the part time workers (vishoka) who are used by TANESCO when there is special operations or many works to be completed in a short period of time. The unfaithful workers do either illegal connections or destroy customer's electricity meters to read less than actual electricity used after getting some money in form of bribe (TANESCO, 2013).

My experience from Moshi and generally in Tanzania is that, theft of electricity and electricity equipment is a common practice. There is a tendency of technicians from TANESCO especially part time workers (vishoka) to do illegal connections, manipulating customers electricity meters so that they can read less than the actual electricity used. This theft of electricity and equipments lead to power interruption. Furthermore, illegal connections done by unfaithful TANESCO workers cause the TANESCO to lose income which affects production of electricity hence power interruptions.

In summary it can be seen that staff from the two organisations had their perceptions concerning the problem of power interruptions. Findings presented indicate that, interviewees from the industry perceived power interruption to be a big problem which affects production and growth of the industry. The problem is caused by government fault, monopoly on TANESCO in electricity sector, much dependency on hydropower, unimplemented energy policies and poor communication between TANESCO and customers. Likewise interviewees from TANESCO looked at power interruption as a small problem in Moshi with little impact on the customers. Electricity interruptions are further perceived to occur due to voltage fluctuation, poor infrastructure, and low generation capacity and sometimes due to maintenance schedule.

This difference in perceptions may be due to difference in understanding of the power interruptions problem and how they are affected. It can be seen that staff from TANESCO are attributing electricity interruptions with technical issues because they have that knowledge. These are the people who deals with electricity production and supply in Tanzania. Further it is seen to them as a manageable problem because they do not depend on it to run the company. However staff from the industry associates the problem with lack of government commitment because that is how they understand and look at the problem of electricity interruptions. Again to these staff electricity interruptions is a big problem because they depend on for production and survival of the industry.

6.1 Coping with Interruptions in Power Supply

The second objective of the study sought to explore coping strategies adopted by the industry. This section covered the coping strategies of interruption in power supply which are either permanent or used during days with interruption.

6.2 Industry's Coping strategies

Employing Part time Workers

The industry employs part time workers especially in production and sales departments. The reason behind this is to pay them according to the work done. If workers are permanent they need to be paid monthly regardless of interruption in power. Out of twenty two workers only five are permanent. This was explained by Nick from the industry that “...*due to the problem of power interruption, I employ temporary workers who are paid for the work they do.*” he said

Also Norbeta from the production unity added weight on employment of part time workers as a positive idea by saying “...*to me it is fine to be paid per work done because the boss is paying us a fair amount. Per week we are paid between forty to sixty thousands depending on the availability of electricity. It is a good amount compared to my colleagues working in other places*”.

From the quotations, it seems that employing part time workers is used as a technique of coping with interruption in power supply within the industry. In reality it is less expensive to run the industry through paying the workers per work done than employing them permanently with the existence of interruption in power supply.

Employing Untrained Workers

The industry employs untrained workers who are only trained on job in various skills within the industry to avoid paying high salaries. These workers are trained to do several jobs in the industry with the same salary. One worker can do different jobs according to the situation and necessity; for example a driver in the industry in my study is also a technician.

As seen in a quotation from Nick “...*I always employ untrained personnel. I trained them in various fields within the industry .For example; my driver helps me in simple repairs since I trained him simple mechanics. In case of major repairs we call a technician from outside the industry.*”

Also Nicolaus supported the training done within the industry to be very helpful to the workers by saying “... *for we who have little education, and with this unemployment situation in Tanzania we are very grateful to the boss. He has trained us practically from the industry otherwise it could have been very difficult to get job*”.

The quotations indicate that employing untrained workers help the industry to run its operations with interruption in power. The management decided to train workers within and pay them between 22-33 \$US per week depending on availability of power as they are paid per work done, as opposed to employing the professional workers which is more costly.

Rescheduling Working Hours

Changing of working schedule from day time to night shifts is used as an interruption coping strategy. All production activities are done during night in days with power interruption of more than six hours. This is because in most cases during the night there

is power. Norbert presented that *“....in days with critical interruption in power of more than six hours, workers in production unit get day off and work during night where mostly there is electricity”*.

Another participant Norbeta said following on rescheduling of working hours due to interruption in power supply *“...we from production unit need to work in night hours due to interruption in power supply. This is possible because in most cases there is power during night”* he said.

It can be seen that there is time rescheduling of working hours in the production unit at the industry due to power interruption. This strategy helps continuation of production in the industry regardless of interruption in power supply.

Working during the Weekends

Working during weekends was mentioned as among the strategies of coping with interruption in power supply. In days with consecutive power off for more than two days workers from production unit need to work during weekends to maintain availability of products. During interviews Norbet gave the following explanation *“...when interruption in power supply is more than two days we from production unit are forced to work during weekends”*.

Another interviewee said that *“for me to work over the weekends is not a problem. Am looking for money so when there is power interruption which is serious we work on weekends and is fine with me”* Norbeta added.

During field work, I observed that where there was interruption in two days of a week and workers worked over the weekend apart from working during night to cover customers' orders.

Excerpts above imply that the industry operates during weekends as a mechanism of coping with power interruption. In this way the industry manage to continue with production.

Use of big and Modern Machine

The management of the industry decided to buy a big machine which can produce as much as possible in a short period of time. The former machine was small with the ability to produce only 20 bags of 50 kilograms per round. The new machine has the capacity to produce 35 bags, each bag has 50 kilograms. The big machine is useful as it helps the industry to have sufficient stock to keep the customers. *“...due to the power crisis we bought a large machine which helps us to increase production”* (Norbet presented).

Again Neila offered the following to explain the efficiency of new machine *“....in deed the big machine helps us in production unit. When power is off for short time we are not forced to come in night shift because we have sufficient food stock”* she said.

I observed the two machines working together and there was sufficient food stock during field work regardless of few power interruption which occurred by then .

The explanations from the interviews and observation show that the introduction of the new machine helps the industry to increase production and maintain the customers. Also it helps to minimize night shifts and work over the week ends when the interruption occurs for a short period. This is quite different from those days when the industry had only one small machine only.

Provision of Bribes

The industry management maintains good relationship and communication with people from TANESCO as a coping strategy to interruption in power supply. The owner of the industry sometimes provide bribe commonly known as (kitu kidogo) (bribe) to some technicians from TANESCO so as to get favour when it comes to power interruption. In days with power cuts, especially planned interruption for maintenance the industrial owner bribes a technician from TANESCO so as to have power *“.... in days with planned power cut off or power rationing I give bribe to the technician so that I have power at my industry”* (Nick said).

During field work, I observed such an incidence where there was interruption in power where the industry is located but it was not affected. Because I am from the same place, I know that bribery is a common practice in almost all sectors. Concerning bribes, the owner of the industry was not worried to talk about it, because I assured him about confidentiality and the study to be anonymous.

From this excerpt and observation, bribery is used as a coping strategy of power interruption in the industry. This practice of bribing is not an ideal practice but it is used and it seems to help the industry to have more time with electricity.

In summary findings indicate that, the industry used the following coping strategies; rescheduling of working hours, working in weekends, employing untrained and part time workers and bribery.

7 Discussion of the Findings

This chapter discusses the findings in relation to RDT theory which guided the study. In this study, two themes from RDT are used in discussing the major findings. Pfeffer and Salancik (1978), who are the founders of RDT, proposed four themes to guide organizations in reducing external dependency. These are: first the organization should endeavour to increase their power over and hence reduce their dependence on critical resources. The second is that the organization can reduce dependence by either acquiring as much control over critical resources as possible or acquiring control over resources that make other organizations reliant on them. The third theme is that the organization can adopt and change to fit environmental requirements and the last one is that the organization can attempt to alter the environment so that it fits the organization's capabilities. From the themes given above, only the following two have been chosen for this study. (a) The organization can adopt and change to fit environmental requirements and (b) The organization can attempt to alter the environment so that it fits the organization's capabilities. The reason is that, the chosen ones are suitable and relevant to my study. The coping strategies adopted by the industry can be analysed using the two themes from RDT.

The chapter is divided into two parts. Part one discusses internal and external coping strategies used in the industry in relation to RDT and literature. Second part presents perceptions in relation to relevant literature.

7.1 Coping Strategies

Due to frequent and abrupt power interruptions in Tanzania, the industry has to adapt coping strategies. These coping strategies have been divided into two namely; internal and external strategies.

7.1.1 Internal Coping Strategies

The industry depends entirely on electricity for production and all other office related works. The industry has come up with many coping strategies which are under internal

coping strategies. By internal coping strategies, I mean the mechanisms that the industry adopts in order to cope with the electricity problem. It is internal because it has something initiated by and within the organisation without consulting other external organisations. The first coping strategy developed was the employing of workers on a part time basis especially in production and sales department. This coping strategy is in line with the RDT's theme (a) which looks at an organisation's ability to transform itself in order to fit environmental requirements. According to the findings, the industry employed workers on part time basis as a coping strategy. According to RDT, when an organization depends on the resource from outside which is not available, the organization can adopt coping strategies in order to survive. Employing part time workers is an internal adjustment and coping strategy which helps the industry. This helps the industry cope because part time employees are only paid for the hours when electricity is available as it is the only time when there is production. Further, this is a coping strategy because if the workers are employed permanently, it means the industry will have to pay them even for hours they are not working due to lack of electricity.

According to a study by (CTI, 2011) on challenges of inadequate supply of electricity to manufacturing industries in Tanzania, industries employ part time workers who are needed in that time when electricity is available. These workers are paid per work done to minimize cost. The CTI report also found that the industry depends on external resource (electricity) which is unreliable. In order for any firm to have many and permanent employees, electricity accessibility and reliability in supply is vital. A constant and reliable supply of electricity would maximize the industry's production and increase profit. However, there is no reason for a firm to buy labour hours when there is no electricity. That is why many industries which are affected by power interruption tend to use this internal coping strategy of employing part time workers (CTI, 2011).

Another study by Salm et al conducted in 2011 also highlights part time employment as internal coping strategies industries used in Tanzania due to constant electricity interruptions. This study states that the use of part time workers is one of the ways of coping with power interruption among small and medium scale textile industries in Tanzania. In this study, they explained that many small industries depend on electricity as the only source of electricity. Like the CTI report and Salm et al reports highlights

the industries' dependency on the unstable electricity supply. According to the same report, the unstable supply of electricity led to industries to employ part time workers for period when electricity supply is available. The workers would be paid for only the amount for the work done. With this perspective, it can be argued that it is possible to run the industry with part time workers than full time workers in an environment with frequent power interruptions.

Cissokho and Seck have looked at the relationship between electricity interruptions and the employment of part time workers in Senegal. This study shows that industries in Senegal are also affected by constant power interruptions and have resorted to employing part time workers as a coping mechanism. The report indicates that employing of part time workers due to interruptions in electricity supply is an important internal coping strategy (Cissokho and Seck, 2013). These industries in Senegal depend on electricity on the national grid power supply which often faces power interruptions. In adjusting to cope with environmental requirements in line with RDT firms had to employ part time workers. Industries which depend on electricity tend to have reduced or lower production levels as a result of power interruptions. Industry's production levels go down even if the power supply is interrupted just for a few hours. If there is low production it means low income for the workers. This causal relationship means that industries are not in a position to pay full time workers. Therefore in the efforts to cope with power interruptions and to be able to continue production, industries decided to use part time workers as the internal coping strategy.

The second internal coping strategy adopted by the industry was to employ untrained workers. Many industries depend on electricity as an external resource though it is faced with frequent interruptions. According to the reports by (Salm et al, 2011), due to few hours of electricity supply, industries tend to have low production level, which leads to low income. This argument is in line with the theme from RDT which states that an organization will adopt or cope to fit with environmental requirements where resources needed cannot be fully accessed. The other result of this second internal coping strategy is where the industry resorts to employing untrained workers. The untrained workers are hired on low salaries and when they are trained, the salaries do not change despite acquiring the skills. When these workers leave this particular work and go to new work places they are still considered untrained because they have no certification for the skills

attained from their previous places of employment. This ensures that the untrained workers cannot leave the place of worker where they received training from for fear of not being able to be employed by other organisations.

The study by (Salm et al, 2011) indicated that the strategy of employing untrained workers in Tanzania's textile industries is due to power interruptions. These textile industries adjust internally to meet the electricity supply interruptions. The findings indicated that disruption in power supply leads to reduction in production which leads to low income in the concerned industries. The low income on the part of industries leads them to employ untrained workers because they can easily accept low pay. Sometimes these workers are paid very low wages depending on the production and it is not easy for them to complain because they are not professional workers. When power interruptions are very critical and production reduces, these untrained workers are likely to be paid very low wages.

Thirdly, rescheduling of working hours is another internal coping strategy of power interruption by the industry. During interviews it emerged that, it has been necessary to change working schedule from day time to night shifts so as to cope with power interruption. Using RDT theme of internal adjustment which advocates that it should be done by an organization to fit into the environment the, management of the industry applied it. It should be noted that management of any organization plays important role in decision making and adjustments for the smooth running of the organization. Therefore the management of the industry decided to reschedule working hour from day time to night shifts because in most cases power is available during night hours. Changing of working hours is used as an internal resource dependence coping strategy to adopt and fit into the environment which faces frequent power interruptions. At the same time, this strategy increases production costs because workers need to be paid extra money for transport and food.

The study by (Trulsson, 1997) on the problem of electricity facing entrepreneurs in Tanzania, findings revealed that the some of the entrepreneurs did internal adjustment to cope with electricity problem. In coping with the interruption of power some industries change working hours to night shift as a strategy to fit into the environment in line with the theme proposed in RDT. All the industries in the study by Trulsson which were

affected by power interruption decided to run production during night where in most cases there was power. It is explained that, this internal coping strategy of running production in night increase production cost as workers are paid over time bonus. This is the negative effect to the industries because while running production in night help maintain production and have enough stock, at the same time cost of production rises.

Further, this internal coping strategy of running production overnight has been discussed by (Alam, 2013) in Indian industries. Alam's study was about the problem of electricity shortage and how industries cope with electricity shortage (which is the environment they depend on). It can be argued that these industries in India in have used the theme in RDT where by an organization need to cope or adjust to fit with the demands. In his study, Alam found out that due to shortage of electricity, industrial management decided to adjust working hours to either night shift or work twenty four hours depending on the extent of power problem. Concerning production costs, it was explained that working over night or twenty four hours increases production costs. Workers from production unit are paid extra time. This coping strategy seems to be common in many industries in India according to (Alam, 2013) as a result of interruption in power supply. On the other side working over night or twenty four hours increased production costs and this brings negative effects to the industry.

In addition literature on power interruption concerning the use of this internal coping strategy where by the industries change working hours especially in the production unit such as (Nooij, Carlijin and Carl ,2007) found that due to power interruption in the firms, there is need of extra time which is either working over night or off peak hours. This internal coping strategy helped the firms to continue production with despite power problems. Due to power interruptions in the firms especially during day time and peak hours, the management arrange for new working schedule which involve extra time to compensate power interruption. Although not mentioned clearly in their study, this organizational change in how it should work is in line with RDT framework. The frame work suggests that organizational actions and behaviour will change towards external resources in which they depend on. Production continues during night and in late hours of the day. This has been very common practice in many small industries in developing countries including the one in this study.

Fourth strategy, is working during weekends. Since the industry in this study needed to survive regardless of interruption in power supply, another internal coping strategy developed was working during weekends. Because electricity is the only source of energy to the industry in this study, the industry has to operate even in weekends in period when there are serious power interruptions. The internal arrangement which is the theme in RDT has been employed by the industry to shape itself to fit and adopt the environment (electricity interruptions). Since the survival of an organization rests on its ability to acquire and maintain resources, different internal techniques are involved including working during weekends.

The above coping mechanism was mentioned in a study by (CTI, 2011) in sixty manufacturing industries in Tanzania. Since the basis of RDT include that no organization has full control of all its resources, organisations to a certain degree depends on the environment to survive , therefore internal adjustment is crucial. The industries have to work during weekends where there is electricity which is seen as coping strategy of power supply problem.

This compensation for power interruption is done in accordance with RDT basis. During power interruptions, production units remain idle for some hours or even a day. Then it is of greater importance to increase working hours or work even in weekends to make sure there is enough stock. The study by CTI indicates that 27 industries out of 60 industries use this strategy in coping with interruptions in power supply in Tanzania (CTI, 2011).Working during weekends ensures stock in the industries but at the same time workers need to be paid extra time money.

In addition (Alam, 2013) in his study argued that dependency on electricity by small industries in India is problematic. RDT framework basis can be used to explain the internal coping strategy adopted by the industries under Alam's study. Electricity was from outside the industries which rely on it to run its production. Since electricity supply is not reliable and the firms have no control over it, it was necessary to cope and fit into the environment to continue production. Therefore firms had to operate more time of the year including weekends and holidays so as to maintain production. Although working extra time helps to maintain production and availability of stock in the industries, it is costly because workers need to be paid extra money.

Fifth, internal coping strategy employed in the industry was the use of new modern big mixing machine to increase production in less time. In trying to change some structures to fit and adopt into the environment in which the industry relies on to run its production that is outside resource as a base of RDT and survive it was necessary to buy a new modern machine. This was again an internal strategy to cope with power interruptions in the industry. The management of the industry decided to buy a big mixing machine which maximizes production in short period of time when there is electricity. The new modern machine which uses new technology helps the industry to cope with power interruptions and maintain production hence survival.

This internal coping strategy of changing technology in order to fit with dependent environment in which the industry operates has been discussed by (Fisher-Vanden et al, 2014) in their study about electricity shortage in China. Electricity supply in China is characterized by power outages and substantially high demand than supply. Firms to a large extent depend on electricity therefore adopting an internal coping strategies are vital. The theme of RDT which is used in this discussion states that because organisations have no to control all its resources then organisations will adopt or cope with the environmental requirements. In doing so firms in China investing directly in new technology which is more efficient. The more the technology is efficient the more the production in faster. This aimed at producing more at short time particularly when power is available.

The above discussion contained internal coping strategies adopted by the industry in this study and many other small and medium scale industries from different other developing countries. The following part will discuss external coping strategies used by the industry in this study and other industries from relevant literature.

7.2 Attempt to Control the External Environment

To ensure that that the industry in this study survives with power interruption, the management introduced some external coping strategies. This includes, among others, keeping good relationship with some TANESCO technicians. In RDT theme which

explain about controlling the external environment in which the industry gets resource (electricity) to run production, good communication was very important for the industry to modify the environment towards its capabilities. The management of the industry communicates with TANESCO technicians on the notification of power interruptions especially during periods of rationing. Also in cases of unplanned interruptions, it was easy for the industry's management to know the duration of power cuts so as to arrange the production schedule.

In modifying the environment using the external coping strategy, firms in Bangladesh keep good communication with government officials (Fernandes, 2006). In his study, it was revealed that the industry's management maintain communication with government official to ask for different services and the more the manager is close to the officials the more it will be easier to get services. According to RDT framework, this modification of the external environment helps the organization to survive. The basis of RDT is that organisations are to a certain degree reliant on their environment therefore it's very important for the organization to alter and adjust its structures and working behaviours to make sure it fits with the environment.

Also, bribery has been used by the industry as an external coping strategy to reduce environment resource dependence. The second theme which guides this discussion from RDT is relevant here in explaining external coping strategies. The theme states that the organization can attempt to alter the environment so that it fits the organization's capabilities. In this study, bribes have been used as an external coping strategies where the industry's management alter the external environment that is bribing the technicians from TANESCO so that either they cut power for only shorter period or not avoid it. Findings in chapter five showed that the management bribed the technicians from TANESCO to retain electricity during power rationing.

In line with the above, a study by Fernandes indicated that bribery by the manufacturing industries was used as an external strategy used to cope with power interruption in Bangladesh. According to RDT theme, the organization can attempt to alter the environment so that it fits the organization's capabilities. These manufacturing industries use bribes to alter and fit into the dependent environment. Bribery has been discussed in manufacturing industries in Bangladesh as an important external coping

strategy by firms. In (Fernandes, 2006) he mentioned that corruption is common in firms when it comes to services from the government officials. More than 85 percent of firms in Fernandes' study indicated that it is necessary to pay bribes to government officials to get services like electricity, business licenses and tax number. Industries depend on these services (electricity, business licenses and tax number) to operate effectively and government officials ask for bribes.

Also bribery as an external coping strategy of power interruption has been discussed by (Hussain et al, 2012) in the study about constraints which face industries in Punjab. Hussain et al noted that many firms in Punjab when contacted government officials for services they were asked to give bribes in order to get services. In relation to RDT, firms give the bribe as a way of altering the environment in which they depend on to run the business. For example when the firm is in need of services like electricity the government officials ask for bribe to connect electricity to the industry. According to the study above, the more the industry is need of services the more it will involve in bribery. . Firms reported that most bribes are given to electricity unit and labour inspectors. For instance up to 5% of annual sales were paid informally to government officials as bribe (Hussain et al, 2012).

The second objective of the study was to explore perceptions of interviewees towards interruption in power supply. Section one presented perceptions of staff from the industry and section two discussed perceptions of interviewees from TANESCO as follows:

7.3 Industry's Perspectives towards Electricity Interruptions

Findings from the industrial staff indicated that interruption in power supply is being perceived as the problem caused by the government. Interviewees from the industry claimed that power interruption is due to lack of the government commitment to deal with power interruption in Tanzania. This finding matches with a study by (Moyo, 2013) conducted in Sub Saharan African countries industries which showed that most of the African countries face electricity shortages because governments are not

responsible. Many countries rely on hydropower as the major source of electricity whilst they have other sources of electricity like solar, renewable energies, wind, geothermal among others. According to Moyo, the governments in Sub Saharan are not investing enough on the alternative power sources and as a result, many African countries industries suffer from interruptions in power supply. Tanzania and Uganda are the among the African countries with accute power problems because the avarage number of power outages is 12 and 11 respectively compared to only two days a month in South Africa (Moyo 2013:1064).

In supporting the perception of interviewees from the industry David Cleopa Msuya the retired Prime Minister of Tanzania in his press conference on 21/09/2011 said that interruption in power supply is a major government fault, it is a shame for the country like Tanzania to experience serious power interruption with all the sources of electricity available. According to David Cleopa Msuya, saying “ it is a shame for a country like Tanzania with all the sources of electricity to experience seriuos interruption in a point of becoming dark country. Only 14 percent of Tanzanians have access to electricity leaving 86 percent with no acess. This problem should be given enough efforts.”

Interviewees from the industry perceived that interruption in power supply is a result of monopoly of TANESCO in electricity sector. This matches with the findings in the study conducted by Cissokho and Seck in Senegal. In Senegal just like in Tanzania, electricity sector is controlled by one government company in generation, transimission and distribution of electricity. This monopoly of electricity by government companies has been argued to cause electricity shortage. It was reported that many government companies are not performing effectively. In Senegal there is limited privatization in the electricity generation and distribution to other companies. At the same time the electricity company which is owned by the government is not able to invest enough in the power sector so as to be acessible and reliable to the customers. Failure of privatization in energy sector cause power supply inadequate in many industries in Senegal (Cissokho and Seck , 2013).

In addition to the perception of the interviewees from the industry on the cause of power interruption due to monopoly of only one company in generation, transmission and supply of electricity is being discussed clearly in the study by (CTI, 2011 and

Pinda, 2008). Power sector is dominated by a single government company (TANESCO), under the Ministry of Energy and Minerals, with the major business of generation, transmission, and distribution of electricity in the country. The company is therefore responsible for all power generation although there are other small sources of generation from Independent Power Producers (IPPs) which sells electricity to TANESCO as a top up of what TANESCO generates. The idea is that the government has to allow IPPs to generate and supply electricity direct to customers to reduce burden to TANESCO and to improve services. Also, involvement of other companies like IPPs would help improve electricity generation and distribution and easy availability of electricity services to customers.

Moreover inequality in power supply and corruption practised by some staff in MEM na TANESCO has been attributed to power interruptions by staff in the industry. It was stated that in areas with politicians and business people are not much affected with power interruptions compared to other areas. According to (Hussain et al,2012) corruption is a major challenge facing firms in their operations where by in order for the firm to get services there is engagement of corruption. In Tanzania and particularly in electricity sector customers are facing the challenge of giving corruption when it comes to services. The management of the industry reported to give bribery for them to have more time with electricity.

Further ,staff from the industry claimed that power interruptions is due to unimplemented energy policies. Nick from the industry argue that “in Tanzania there are good energy policies in generation and distribution just written in paper but are not well implemented to improve electricity supply. The energy policies which are available if were implemented they can minimise electricity supply problem”. This finding is seen in the study by (Weare, 2003 and Pegels, 2010) in California and South Africa respectively where they argued that failure to implement policies in energy generation, transmission and distribution has been the cause of electricity shortage in California and South Africa. The governments failed to control electricity market after restructuring of market policies. If policies and regulations on electricity generation and distribution are not implemented there is the possibility of experiencing power crisis. It is very important to implement policies and regulation in order to reduce or remove electricity shortage world wide.

7.4 TANESCO Perspectives towards Electricity Interruptions

During data collection, interviewees from TANESCO claimed that power interruption is due to high demand of electricity than supply amount. Currently there is high demand of electricity in Tanzania due to the growth of population and economic activities which need more power. This perception from TANESCO is not exclusive to Tanzania. (Amponsah and Imoro, 2012 and Priktiknjo, 2014) have explained that high demand than supply is perceived to be the cause of interruption in power supply in industries. There is low installed capacity and no reserve margin which lead to inadequate power generation in the country and hence low electricity supply. Demand is increasing every time due to population growth and economic development which uses electricity as an engine.

In addition to high demand than supply being a contributing factor to interruptions in power supply, a study by (World Bank, 2008) revealed that the cause of electricity system unreliability is the growing demand of electricity which exceeds the installed generation capacity. In Sub-Saharan African, developing economies are skewed towards industry and manufacturing rather than services. Therefore it is important that new generation capacity is added at the same rate as GDP growth but in actual sense is not done. In recent decades, regional GDP has grown at an average of 5%, while generation capacity has grown at 2.9% (World Bank, 2008). This situation will inevitably give rise to supply shortfalls during periods of peak demand within the country.

A study by (Eberhard et al, 2008) supports the perception from TANESCO that high demand of electricity than supply causes grid instability leading to power interruptions. When the demand of electricity exceeds the amount of electricity being generated, there occurs grid instability. It has been argued that when demand exceeds supply a blackout will follow and it may take a significant period of time to restore supply. Services will typically run a reserve margin to ensure that the grid remains stable if power demand were to suddenly peak. The Southern African Power Pool, which is affected by a supply shortfall, aims for 10.2% reserve. If the reserve margin is compromised, and then

utilities will typically resort to load shedding, which is the selective turning off of sections of the grid in order to maintain overall stability.

The second perspective on power interruptions from TANESCO staff was voltage fluctuation. Voltage fluctuation of electric current is perceived as a contributing factor to electricity interruptions. Voltage fluctuation can be caused by poor generation and overload in electricity system. This finding corresponds with a study by (Yamashita et al, 2008) who reported in their study that voltage fluctuation is one of the causes of power interruptions. The studies were about blackout and the risks associated with, they indicated that rising and lowering of voltage capacity leads to power cuts hence power shortage in the firms.

In addition (Koval et al, 1993 and La Commare and Eto, 2006) discussed how voltage change affects availability of power. They did a study about power anomalies and costs involved. It was shown that power interruption can be caused by voltage fluctuations. During electricity distribution, there is a need of constant voltage. In case of any irregular flow of electricity during transmission there will be power off due to insufficient supply. This will affect industrial productivity especially for the industries with no alternatives like the one under this study and power off may lead to destruction of industrial machines and other equipments.

Besides voltage fluctuation, poor and worn out infrastructures contributed to power interruptions within the country. From (TANESCO, 2012) poor infrastructure in power system is presented as a contributing factor for interruption in power supply. The electricity transmission and distribution cables are very old. Many of them have never been replaced since the 1960s. This leads to irregular breakdown, for example falling of the electricity poles, electric cables and failure of the system to operate effectively. When the infrastructures are old, the electricity system cannot work properly.

Also a newspaper called *Mwanahalisi* of 18/07/2012 reported that interruptions in electricity supply affected almost the whole country due to worn out infrastructures. Engineer William Mhando the Kilimanjaro Regional engineer presented in *Mwanahalisi* that TANESCO infrastructure had been used for more than 30 years without being replaced. He added that they are out of date, completely broken and causes serious

problems in power generation, transmission and distribution. Therefore, poor infrastructure is perceived to be a cause of power interruption by other people from TANESCO apart from the interviewees (Miruko, 2012).

Further (Moyo, 2013 and CIT report 2011) discussed poor infrastructures as a challenge facing electricity supply in Tanzania. The major challenge facing power supply is the worn out infrastructure both for production, transmission and distribution. According to these studies, the experience of interruption due to poor and old infrastructures is common in Tanzania. This leads to either low production of electricity hence low power supply.

This perception is being supported by a (World Bank, 2008) report which discusses poor maintenance of electricity system in sub Saharan regions. Lack of maintenance of old plants and old transmission infrastructure affects power systems and leads to power interruption in the region. In underperforming utilities, managers may often face a choice between buying spare parts, importing fuel or paying salaries and as much as 25% of installed capacity is not currently in operating order. Whether it is a lack of capital investment or a lack of maintenance, the underlying reasons for the underperforming power systems is poor and worn out electricity infrastructure. It can be argued that for the power system to work effectively in Sub Saharan African, huge capital is needed to maintain the existing ones and replace the old ones.

During interviews, it was noted that both interviewees from TANESCO and the industry believed that power interruptions is a problem caused by theft of electricity and electricity equipments. According to (Degani, 2013) theft in electricity sector is a major contributing factor of power interruptions. There is a tendency of customers to use part time TANESCO technicians to connect for them electricity illegally. These illegal connections may cause overload in the electricity system and insufficient power supply hence power interruptions.

Moreover (Lyimo, 2006) supports the perception of theft of electricity as a contributing factor to interruptions in power supply in Tanzania. It was mentioned that among challenges facing TANESCO to operate effectively is the theft by unfaithful TANESCO workers and especially part time workers commonly known as “vishoka”.

These workers receive money from the customers and offer customers little paid service through destroying meters so that they read less than actual used electricity and illegal connections. The perceptions of the interviewees on power interruption seem to be similar to interviewees from different studies in the literature used to support the findings of this study. The issues of bribery, unimplemented energy policies, voltage fluctuation, poor electricity infrastructures mentioned in this study as causes of power interruption can be found in the literature written by other scholars which are used in my discussion.

Although my data are limited to only few interviewees they reflect the perceptions and coping strategies used in medium and small industries in the developing world. The internal and external coping strategies adopted by the industry in this study is a reflection of strategies used by many industries in developing world which experience the problem of electricity interruptions. This is seen in some of the literature used in this study.

7.5 Government Strategies in Minimising electricity Interruptions

The government of Tanzania recognizes power interruption problem and have put in place some mechanisms country wide to improve the situation. The government is carrying out some measures and different electricity projects all over the country.

The government through MEM and TANESCO is doing a number of things to cope with power interruption country wide. First strategy is the improvement and increase electricity generation capacity from 1220 MW up to 1396 MW in 2014 (URT, 2014). This effort has not been fulfilled yet. Apart from improving generation capacity, the government is implementing electricity projects such as Makambako-Songea of kV 200, Dar es Salaam-Chalinze-Tanga-Arusha kV 400, and Iringa- Shinyanga kV 400. It is expected that after the implementation of these projects power supply problem will be reduced (URT, 2014).

In addition, the government is working to increase power generation, distribution and transmission, developing alternative sources of cleaner energy and renewable energy sources. The government is also promoting energy efficiency use and conservation. This is an important factor for providing reliable and affordable energy supply in all productive sectors. Installed capacity is forecasted to increase from 1,100 MW in 2011 to 2,780 MW in 2016 (URT, 2012). In 2014 to date the government is heavily investing on the big project of electricity through natural gas from Mtwara and Lindi to Dar es Salaam. The project is under construction if successfully implemented there is a big possibility of reducing electricity shortage in Tanzania.

Second strategy by the government in coping with power interruptions is the renovation and replacement of worn out electricity infrastructure which cause either electricity loss or power cuts. Up to 2014, the government has renovated transmission and distribution lines and reduces power loss by 19 percent country wide (URT, 2012).

The third strategy the government is using to improve power supply is the implementation of REA projects in sixteen regions in Tanzania. Up to 2014 there was reasonable power access improvement in rural areas of regions of Arusha, Dodoma, Kagera, Kigoma, Kilimanjaro, Manyara, Mara, Mbeya, Morogoro, Mwanza, Pwani, Rukwa, Shinyanga, Singida, Tabora and Tanga (URT, 2014). Also REA projects under Turkey Phase II which will enhance availability of reliable and affordable power supply in rural Tanzania.

The fourth strategy is to ensure implementation of energy policies which deal with electricity access and encourage privatization. The idea behind privatization is to encourage competition in electricity generation, transmission and distribution. Also the government is planning to join electricity market where there will be importation and exportation of electricity neighbour countries through Southern Africa Power Pool (SAPP) and East Africa Power Pool (EAPP) (MEM, 2014)

The fifth strategy by the government in reducing power interruption is seeking financial support from United States of America. In construction of 200MW Kiwira coal power generation project and 400kV Chalinze-Morogoro-Dodoma transmission line the

government is seeking US for financial support. It is explained that if this project is successful it will reduce power interruption to a large extent (MEM, 2014).

Summary of the Chapter

This chapter has discussed the coping strategies used by the industry in my study. It explored the perceptions and strategies of the government in coping with interruption in power supply. Some perceptions about power interruptions guide the industry to develop some coping strategy in relation to RDT framework. The internal and external coping strategies used by the industry are discussed in relation to RDT framework. Two themes from the theory guided the discussion on coping strategies of electricity interruptions in the industry. The internal coping strategies includes use of part time and untrained workers, use of big and modern machines, change of working time and working over the weekends. External power interruption strategies included; use of bribe and good communication with TANESCO.

The perceptions of interviewees regarding power interruptions from the industry and TANESCO were; government fault, unimplemented energy policies, monopoly of TANESCO in power sector, voltage fluctuations, theft, high demand than supply, worn out infrastructures and lack of fund among others.

The government of Tanzania has taken different external and internal strategies in reducing interruption of power supply in the country. The internal measures include increasing generating capacity, renovation and replacement of infrastructure system and implementation of several power projects in rural and urban areas. The external strategy is mainly seeking of financial support from different donors to invest more in electricity sector.

8 Conclusion and Recommendations of the Study

Summary of the Study

This study aimed at exploring the perceptions of electricity users in the industry and TANESCO towards interruption in power supply and coping strategies adopted by the industry. This chapter presents the summary of the study, conclusions and recommendations for improvement and for further study in the area related to the study.

The purpose of the study was to explore the perceptions of interviewees in the industry and TANESCO towards interruption in power supply and coping strategies used by the industry. The specific objectives of the study were; first to explore the perceptions of interviewees towards power interruption and secondly to describe the coping strategies used by the industry.

The motivation for the study had partly grown out of my concern over serious power interruption in Tanzania and how small industries cope with the problem. Also it was much catalysed by power rationing which took place between 2011 to 2013. In these two years it was possible to have power interruptions for 12 hours of a day. I had an experience that most small industries in my area had no alternative source of power. Therefore I was curious to know how production is done in these small industries and how staffs perceive electricity interruptions. Therefore, this study was conducted to answer my research questions.

The study was limited to one small scale industry in Moshi. It involved interviewees from TANESCO Regional Office Moshi and staffs from the industry study. The study encountered some limitations. One of the limitations was time and lack of fund. Due to limited time and fund I conducted my study in only one industry. This study therefore, does not represent all information about both perceptions of electricity users in industries and TANESCO and not all the coping strategies used by small industries in Tanzania. However the information from the study is a reflection of the situation many small industries are facing in developing countries regarding electricity interruptions.

This is seen in the relevant literature revised in relation to my study, the coping strategies adopted by firms in these literatures are similar to the ones used in the industry under this study.

The literature reviewed examined the interruption in power supply in Tanzania and outside Tanzania. These literatures describe causes, effects and costs of the electricity interruptions worldwide. Also the coping strategies used by the small industries in the developing world which are facing power interruptions have been presented. Causes of interruption in power supply included high demand that supply, poor and worn out electricity system, lack of capital, low generation capacity and voltage fluctuation. Further, the literature indicated some effects of power interruption including production loss, increase in production costs and destruction of machines.

Moreover, literature revealed that firms around the developing world adopted coping strategies in dealing with power interruptions such as use of part time and untrained workers, working in late hours and weekends, change of technology to the more efficient one and the use of alternative sources such as generators and off-grid sources.

The study was guide by theoretical framework from Pfeffer and Salancik (1978), who are the founders of RDT. The framework focused on how an organization can adjust, adopt and cope with scarce dependence resource which is outside the organization (electricity was a scarce dependence resource obtained outside the industry). Two themes among the four from RDT guide this study (a) The organization can adopt and change to fit environmental requirements (b) The organization can attempt to alter the environment so that it fits the organization's capabilities. These were chosen because they are relevant and suitable in analysing this study. These themes are used to explain the internal and external changes done by the industry to cope with interruption in power supply.

The study employed a qualitative research approach and interviewees were from TANESCO and the industry. The study employed a case study design in order to understand in depth the perceptions of the interviewees towards power interruption together with describing coping strategies adopted by the industry in this study.

Three research instruments were used in the study. These included semi-structured interviews, observation and document review. Data collected was assembled under specific categories based on the main themes such as perceptions of interviewees and coping strategies used by the industry.

The findings from the study showed that there is difference in perceptions between interviewees from TANESCO and those from the industry, this is because the one group of interviewees (TANESCO) looked at electricity interruptions as a technical problem while those from the industry associates it with lack of government commitment. Interviewees from TANESCO perceive interruption in power supply as a small and manageable problem with little effects to the customers. Moreover these interviewees perceived power interruption to occur during maintenance days or to be caused by voltage fluctuation and some technical breakdown in the system.

However, findings from the industry indicated that interruption in power supply is a big problem which caused loss of revenue and the problem is associated with government faults. To them, government is not working effectively to eliminate power interruption. Also they perceive power interruption to be caused by worn out infrastructure, lack of capital for renovation and unimplemented energy policies and much dependency on hydropower.

The findings from the industry showed that power interruption is due to corruption within MEM and TANESCO. These corruption tendencies practiced by official and part time workers from TANESCO caused a lot of problem in service provision to customers. Also findings indicated that there is lack of communication between customers and TANESCO whereby in case of breakdown it takes long time to be fixed and people experience power interruption. In addition monopoly of TANESCO in power generation, transmission and distribution reduce competition and quality of services becomes low.

The industry had no alternative power supply therefore it was necessary to adopt some coping strategies. Electricity in the industry was faced with interruptions; findings indicated that the industry developed some coping strategies to continue production. The strategies include employing part time workers, the use of untrained workers,

rescheduling of working hours, use of new modern machine, work over the weekends and use of bribe were mentioned.

8.1 Conclusion of the Study

The study has shown that there is a serious problem of power interruption in the industry. As stated in chapter six the main function of the industry is production of animal feeds. Power interruption is a major challenge because the industry has no alternative source of electricity for the production. The reasons for power interruptions are attributed to poor infrastructure, lack of fund, low generation capacity, lack of government commitment in eradication of electricity interruptions, high demand than supply, voltage fluctuation, communication barrier, poor infrastructure, unimplemented energy policies, and electricity theft.

There is difference in perceptions of interviewees towards reasons for interruptions in power supply. Interviewees from the industry associated power interruption with government poor performance, corruption, monopoly of TANESCO in power sector and high demand than supply, while from TANESCO interviewees associated the problem with technical reasons like voltage fluctuation, maintenance reasons and breakdown.

It can be argued that regardless of the difference in perceptions over the causes of power interruptions among the two groups of interviewees, all the reasons given show that the problem of electricity interruptions exists in Moshi and Tanzania. This can be seen from the findings of this study and being supported by relevant literature used in my study about power interruption in Tanzania and outside Tanzania. It was argued that the problem of power interruptions affects many small scale industries and they have developed coping strategies to continue production.

Therefore power interruption has to be eliminated in Moshi and Tanzania at large for the betterment of the industries and all electricity users. The problem can be eradicated by the government through TANESCO, TPDC, EWURA and REA which are the organs under the MEM. There is need to improve performance in these energy bodies

by improving and implementing energy policies which will help to improve electricity access and availability in the country. The government should make sure that these four organs are responsible to ensure power accessibility and reliability to the customers especially industries which are the large electricity consumers. This can be done by improving generation capacity, use of other sources of power such as renewable energy, gas and solar. Further, because energy sector in Tanzania is faced with many challenges such as lack of fund among others, there is need of the government to encourage privatization in electricity sector from inside and outside Tanzania to improve services.

8.2 Recommendations

Recommendation for Action

It can be seen from different reports from MEM and other related literature used in this study, generation capacity is low in Tanzania. There is need to increase generation capacity by extending stations, build new ones and use of other alternative sources of electricity than hydro source.

Additionally, to date the main source of electricity in the country is hydro; other sources of power like oil, gas, coal and renewable natural gas are underutilised. Is only recently the government has discovered gas in Mtwara a region in Tanzania. The project is under construction in order to improve electricity access in Tanzania. The government should investigate other area believed to have gas and renewable natural gas to increase electricity generation capacity in the country. Therefore there is need for maximum utilization of these alternative power sources to reduce and possibly to eradicate the problem of electricity interruption in Tanzania.

Electricity access is still very low in Tanzania to date only 18% of Tanzanians have access to electricity and the situation is worse in rural areas where only 2% have access(TANESCO,2014). There is need for the government to improve electricity access level in Tanzania urban and rural. Many scholars have emphasized the importance of electricity for development (Mohamed and Tomonari, 2014) argues that there is a direct relationship between energy use and social development. As countries

develop, there is an improvement to the standard of living which consequently increases modern energy intensity per capita. In this world today development is in relation to electricity. All the developing countries have stable electricity supply compared to developing world. Thus for Tanzanians to develop in socio-economic sectors availability of cheap and reliable electricity is fundamental

Other scholars (Odhiambo, 2009) also emphasized that energy is a prerequisite condition for development, pointing out that electricity consumption is directly linked to development as other capital goods such as land and investment. The government should give attention and make sure that the entire country is supplied with reliable power. Based on Mohamed, Tomonari and Odhiambo it can be argued that for Tanzania to develop in socio-economic sectors availability of reliable electricity is fundamental.

Another area in electricity sector which need to be improved to improve services in infrastructure system. As it has been pointed out in the previous chapters, electricity infrastructures are old and worn out. There is need to renovate and change the out dated ones to make sure the system function properly. This is important because poor infrastructure contributes to the power interruptions. As discussed in data presentation chapter poor and worn out infrastructure contributes to electricity interruptions. This is because old infrastructures are subjected to frequency breakdowns, technical and non-technical faults. Also in relation to poor system of infrastructure sometimes there is failure to carry sufficient load and cause power off. According to (Odhiambo, 2009) the major obstacle of increasing electricity supply stability is poor infrastructure in the whole system from generation, transmission and distribution. Thus grid extension, renovation of the system is the best solution, which can provide stable electricity across Tanzania. However grid extension and system renovation requires huge amount of investment which the government lack. Therefore to overcome this challenge of lack of fund government should attract private sector from inside and outside Tanzania to invest on energy sector.

Further, electricity demand in Tanzania is faced with a big challenge where by supply is less than the electricity needed. It can be argued that there is need to implement policies which encourage efficient electricity consumptions. The government through MEM which prepares energy policies should increase and educate people on the efficient use

of electricity. Thus implementation of the efficient energy use policies in the country would help in effective use of electricity and enhance stability in power supply. This is because a required amount of electricity will be used in accordance with the need and reduces consumption of power (Rugabera, Hwang and Kim, 2013).

Further, diverse electricity sources for different electricity uses is of great importance, that is different sources of energy are more cost-effective in some uses than in others. Thus it will make economic sense to use electricity for lighting and liquid petroleum gas for cooking. According to (Martins, 2005) it makes more sense to consider different energy ladders for different types of applications. Efficiency electricity use will reduce consumption and hence stability in supply.

Recommendation for Further Studies

Since the study dealt with only one small scale industry and one TANESCO office, I recommend further studies on many small scale industries to examine the perceptions and coping strategies employed by small industries in Tanzania. Further the study employed qualitative approach, a case study design with only three tools in data collection, more research which involves quantitative or mixed method may be used so as to cover a larger sample scale and views of many electricity users from the small scale industries. In addition more research can be conducted may be a comparative study to examine perceptions and coping strategies employed by small and medium scale industries in Tanzania.

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Appendix

Appendix 1 Informed Consent Form

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Free Informed Consent Form

Coping with Power Interruptions in Tanzania .A Case Study of a small scale animal food processing industry in Moshi Municipality.

Researcher: Theodora Ephrem Kavishe
Status: Master Student
Centre for Development and Environment
Faculty of Humanities
University of Oslo, Norway.

The main objective of research: The overall objective of this study was to investigate the perceptions of electricity users in industry and among TANESCO towards interruption in power supply and coping strategies used by the industry.

Research procedures: this study will employ in depth interviews, observation and document analysis. The information will be collected in the two organizations such as TANESCO Regional Office Moshi and from the industry. The participants will be staff from all levels in these organizations. Interviews, observation and documents will be used for gathering information to achieve the main purpose of the study. The decision to participate in this study is very important, and therefore you are kindly requested to

answer questions in your opinion, knowledge as well as experience and give full cooperation to the researcher.

Confidentiality: the information you give will be confidential, your information will be accessed only by a researcher and in some cases by my supervisor Tanja Winther. In any way, your information will be not linked to your individual name. Your name will not be mentioned in this report. The information that you will provide will be paraphrased to you for accuracy and validation of the data written or recorded.

Benefit: there is no direct benefit for your participation in this study. Yet, through your experience in power sector and power problem your information will help the researcher in making clear and strong suggestions for the government to pay more attention in electricity sector.

Risks: there is no anticipated risk or embarrassment for your participation in the study.

Participation: your participation in this study is voluntary. You have the right to decline participation or withdraw from the study at any time you wish to. Equally important, you are not subjected to say why you are quitting the study. If you agree to participate into the study, please give your name, signature and date below.

Respondent: name..... Signature..... Date.....

Researcher: Theodora Ephrem Kavishe Signature..... Date.....

Appendix 2 Interview Guide for the staff in the Industry

The interviewees of this group involved 2 female and 3 male from all levels in the industry. Their age ranges from 20 to 50 years. The education level ranges from primary certificate to degree level. The work experience of this group was between 2 to 7 years.

Personal Information

Age.....

Gender.....

Education level.....

Work experience....

Profession.....

- ❖ When did this industry started?
- ❖ What type of animal food does the industry produce?
- ❖ What is the type of power used for production? Do you experience any power interruptions?
- ❖ How much is the price of electricity per unit for this industry?
- ❖ Are there increments of price for last three years?
- ❖ What is the alternative power used in days with interruptions?
- ❖ How do perceive power interruptions in this industry?
- ❖ Do you experience any consequences of power interruptions?
- ❖ How often is power interruptions occur in a week?
- ❖ What are your perceptions towards power interruption?
- ❖ Are power interruptions a big problem here?
- ❖ Which are the power interruptions coping strategies used in the industry?

Appendix 3 Interview Guide for staff in TANESCO

The interview participants from TANESCO included three engineers from department of maintenance and emergence. All were male and they have bachelor degree. Their working experience is between 11 and 19 with age ranges from 37 to 45.

Personal Information

Age.....

Gender.....

Education level.....

Work experience....

Profession.....

- ❖ What are the main functions of TANESCO?
- ❖ What are the source of electricity and the capacity of the substation you are using?
- ❖ How much is the price of electricity per unit for the small industries?
- ❖ Is there an increment of electricity price for last three years for the industries?
- ❖ What are your perceptions towards power interruptions in Moshi?
- ❖ Do you experience any consequences of power interruptions?
- ❖ How often is power interruptions occur in a week?
- ❖ What are your perceptions towards power interruption?
- ❖ Are power interruptions a big problem here?

Appendix 4 Research Permit Letter

**THE UNITED REPUBLIC OF TANZANIA
PRIME MINISTER'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT**

KILIMANJARO REGION
Telegrams 'REGCOM' KILIMANJARO
Tel. No. 027-2754236/7, 2752184
Fax No. 027-2753248, 027-2751381
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OFFICE OF THE REGIONAL COMMISSIONER,
P. O. BOX 3070,
MOSHI

In reply please quote:

Ref. No. DA. 21/275/01/83

03rd September, 2014

Manager,
TANESCO – MOSHI
MOSHI ANIMAL FEEDS
MOSHI

RE: RESEARCH WORK PERMIT

I would like to inform you that your student **THEODORA EPHREM KAVISHE** who studies at University of OLSO and pursuing Masters in Culture, Environment and Sustainability.

She has been accepted to conduct her research in this region (**KILIMANJARO**) at **TANESCO** and **MOSHI ANIMAL FEEDS** from September to November 2014.

We kindly ask for Cooperation during her research work.

N. E. Mshana

For: REGIONAL ADMINISTRATIVE SECRETARY
KILIMANJARO

Copy:

Theodora E. Kavishe
✓ Student

for, Regional Administrative Secretary
KILIMANJARO

Supervisor
University of OLSO
NORWAY



UNIVERSITY
OF OSLO

**CENTRE FOR DEVELOPMENT
AND THE ENVIRONMENT**

To whom it may concern

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Oslo, 24.06.2014

Reference for Theodora Ephrem Kavishe

I am Theodora's supervisor. This year she will start the work with her Masters thesis as part of the program "Culture, environment and sustainability" here at the Centre for Development and the Environment (SUM), University of Oslo.

Her master thesis has the preliminary title "Handling interruptions in power supply. Perspectives of an industrial company in Moshi, Tanzania." The aim is to understand how interruptions in power supply affect industrial actors, a highly underresearched area of study. To obtain data, she intends to do fieldwork/interviews in a food producing company in Moshi. She also wishes to interview other relevant actors, such as TANESCO staff.

The fieldwork is planned from August to November 2014, when she will return to Norway to write up the thesis (to be completed in May 2015).

I hope that every effort will be made to facilitate Theodora's study. I believe that the results will be important for understanding the effects of interruptions in power supply and how such situations may be handled for the best of company and staff. The results will be openly accessed. In the publications (e.g. thesis), the names of informants (and possibly companies) will be changed if the informants so wish.

Kind regards

Dr. Tanja Winther
Supervisor

Senter for Utvikling og Miljø
Universitetet i Oslo